


101 THINGS YOU DIDN'T KNOW ABOUT

DA VINCI

Inventions, Intrigue, and *Unfinished Works*



CYNTHIA PHILLIPS, PhD, and SHANA PRIWER

Thank you for downloading this Simon & Schuster ebook.

Get a FREE ebook when you join our mailing list. Plus, get updates on new releases, deals, recommended reads, and more from Simon & Schuster. Click below to sign up and see terms and conditions.

[CLICK HERE TO SIGN UP](#)

Already a subscriber? Provide your email again so we can register this ebook and send you more of what you like to read. You will continue to receive exclusive offers in your inbox.

101 THINGS YOU DIDN'T KNOW ABOUT

DA VINCI

Inventions, Intrigue, and *Unfinished Works*

CYNTHIA PHILLIPS, PhD, and SHANA PRIWER

ADAMS MEDIA

NEW YORK LONDON TORONTO SYDNEY NEW DELHI

CONTENTS

Introduction

Part 1. In the Beginning

1. Where It All Began: Vinci, Italy
2. The Mamas and the Papas, and Everyone in Between
3. “Current Events” in Fifteenth-Century Italy
4. The Life You’re Born Into
5. Siblings of a Genius
6. It’s All Relative
7. Youthful Adventures
8. Get to Work! Leonardo’s Early Training
9. What Did They Do Before There Were Bookstores?
10. Apprenticeship, or Learning from Your Elders
11. Turning Dust Into Gold: Early Painting Experience
12. Getting Off to a Good Start
13. Membership Has Its Privileges
14. Striking Out on His Own
15. The Rebirth of Italy
16. Renaissance Religion
17. Don’t Forget the Golden Oldies

18. Show Me the Money!
19. The Importance of Being Sponsored
20. Lorenzo the Magnificent
21. Playing Up to the Duke
22. Look Out, It's Cesare Borgia!
23. The Best of the Louis
24. Don't Mess with the Pope
25. Francis I, King of France and Friend of Leonardo
26. Da Vinci University

Part 2. The Best of the Best of the Best

27. Early Sculpture: A Celebration in Three Dimensions
28. Form, Function, and the Whole Nine Yards
29. A Horse Is a Horse, of Course, of Course
30. Draw Up a Chair
31. The Scene Behind the Scene
32. Finish That Painting! Leonardo and the Fine Art of Completion
33. Building the Scene-Scape
34. An Architecture of the Imagination
35. It's All in the Details
36. Monks and Lawyers and Artists, Oh My!
37. The Life and Times of *The Last Supper*
38. There's Something about Lisa
39. Oldies but Goodies
40. Building the Renaissance

- 41. The Milan Dome
- 42. Order in the Church!
- 43. San Giovanni Church: Closer to Heaven
- 44. Build It and They Will Come: Designs for Other Public Structures
- 45. Military Architecture: The Design of Defense
- 46. He Built This City

Part 3. What It's All About

- 47. Observe and Understand
- 48. Love That Body!
- 49. From the Inside Out: Studies of Human Systems
- 50. Fawning over Flora
- 51. The Perfect Man
- 52. Getting Physical with Science
- 53. It's All in the Circle Game
- 54. Before Planes, Trains, and Automobiles
- 55. War Games
- 56. Building a Better . . . Cannon?
- 57. Leonardo's Robot
- 58. Chutes (We Already Covered Ladders)
- 59. It's a Bird, It's a Plane, It's a Flying Machine!
- 60. Leonardo's Whirlybird
- 61. The World Before Xerox
- 62. Under the Boardwalk, Down by the Sea
- 63. Containing the Forces of Nature

- 64. Harnessing the Power of Water
- 65. The Ocean Liners of the Future
- 66. Around and Around We Go
- 67. Gone with the Schwinn
- 68. A Coach Fit for a King

Part 4. Writing, Drawing, and Music

- 69. The Leonardo Diaries
- 70. Every Binder Needs a Few Dividers
- 71. And the Lucky Winner Is . . .
- 72. Decoding the Codices
- 73. Say “Cheese!”
- 74. It’s Like Looking in a Mirror
- 75. Write to the Point
- 76. Bringing Down the House

Part 5. Who, What, Where, and What Else

- 77. Michelangelo: The Renaissance’s Other Great Artist
- 78. The Young Master, Raphael
- 79. Botticelli on a Half Shell
- 80. Titian: His Own Personal Giant
- 81. Machiavelli: The Literary Prince of the Renaissance
- 82. Talking about a Religious Revolution
- 83. Center of the Universe
- 84. Leonardo on the Analyst’s Couch

Part 6. The Writing on the Wall

- 85. Vegetable Soup for a Gentle Soul
- 86. Highly Personal Accusations
- 87. Amigos, Compadres . . . Lovers?
- 88. Let's Talk about Sex
- 89. Warning: Genius at Work
- 90. Minor Errors of a Major Genius
- 91. Why Be Normal?
- 92. Crazy Like a Fox
- 93. More Than Meets the Eye
- 94. "R-e-s-p-e-c-t"
- 95. Sincerest Form of Flattery
- 96. A Horse of a Different Color
- 97. In the Beginning, There Was Religion
- 98. It's All in the Name!
- 99. In Sickness and in Health
- 100. Leonardo da Vinci: The Renaissance Man
- 101. Da Vinci in Popular Culture

About the Authors

Works Cited

Index

INTRODUCTION

Everyone's heard of Leonardo da Vinci—he painted the *Mona Lisa*, he was the first Renaissance man, and didn't he write in some kind of code? But there's much more to Leonardo than that! Did you know that he was one of the first people to make detailed anatomical drawings? Or that he designed one of the first robots? Leonardo da Vinci was not only an amazing artist, he was also a talented scientist, inventor, and musician. Was there anything he wasn't good at? Indeed, Leonardo rarely failed at anything—except he did have a problem finishing what he started!

Leonardo came from less-than-extraordinary beginnings. He was born in 1452, to a young unmarried couple in the Tuscany region of Italy. Both his parents married other people and eventually had seventeen more children, but none of Leonardo's half siblings went on to become particularly famous. Clearly, Leonardo was special.

By the time he was sixteen, Leonardo's artistic talents were becoming obvious, and his father apprenticed him to a leading artist in Florence. When Leonardo painted a small angel in one of his boss's paintings, he did such a good job that his master supposedly took one look and swore he'd give up painting forever! Leonardo certainly knew how to make an impression.

Throughout his long career, Leonardo worked for everyone from kings and dukes to warlords. He wasn't just a painter, either—he traveled as a military engineer with the infamous Cesare Borgia, using his genius to create machines of war. During more peaceful times, Leonardo was fond of making mathematical discoveries, investigating the secrets of the human body, and inventing parachutes. In his spare time, he even came up with plans to divert an entire river!

In spite of these endeavors, Leonardo is mostly famous today for his paintings, though only a handful of his finished works survive. Leonardo started countless projects, but finished only a few. Even the paintings he did manage to finish suffered from his constant innovation. In fact, most of Leonardo's inventions weren't ever built—he would come up with an amazing design, work on it for a while, and then when he was satisfied that it might work (or was just plain bored), he'd move on to something else.

Luckily for us, Leonardo wrote about these unfinished projects in his detailed notebooks.

Even during the Renaissance, it was clear that Leonardo was a genius. But when we look at his accomplishments today, the breadth of his talents is even more remarkable. Not only did he paint one of the most amazing and talked-about paintings of all time, the *Mona Lisa*, he came up with designs for a helicopter, a mechanical loom, a car, a bicycle, and a multibarreled gun!

Leonardo really is the definition of a Renaissance man: he was not just good at what he did; he was a groundbreaking innovator. Many of his designs would have revolutionized society if they'd been built during his time. Of course, that was one of Leonardo's biggest problems—he was ahead of his time. Although it would have been impossible to build many of his inventions with the limited resources available during the Renaissance, when models have been built in modern times, they've worked perfectly. Imagine what he could have accomplished with modern technology!

Fasten your seatbelts, sit back, relax, and enjoy this tour through the phenomenal accomplishments of one of the most amazing people ever to live!

PART 1

In the Beginning

ONE OF THE Renaissance's favorite sons had a less-than-spectacular start in life. Born the illegitimate son of a notary and a peasant girl in a small town near Florence, Italy, Leonardo da Vinci soon rose to fame as no one else could (or did). His family, his surroundings in the Tuscan countryside, and the time of his birth all influenced Leonardo's formative years—the early years of the burgeoning Italian Renaissance.

Because of his illegitimate birth, Leonardo didn't have to follow in his father's footsteps. He was able to spend much of his childhood studying exactly what he wanted, rather than what he was told to; he spent years looking at and drawing the world around him. Later, Leonardo's apprenticeship in Andrea del Verrocchio's workshop had an enormous impact on his artistic and scientific works. Once he "graduated" to doing his own projects, he incorporated many of the Renaissance's rapidly evolving themes. At the time Leonardo entered Verrocchio's workshop, Florence was the hub of a bustling new world of intellectual expression, trade, banking, and other innovations. As Europe burst out of the stagnant Middle Ages into a flowering period full of promise, Leonardo da Vinci was at the center.

Where It All Began: Vinci, Italy

Every good story has an eventful beginning, and this one begins with the birth of a child named Leonardo in Italy, on April 15, 1452. In those days, it was customary for Renaissance Italians to take the name of their birth city as part of their full identification. And so Leonardo, by virtue of being born in Vinci, was known as Leonardo da Vinci (Leonardo from Vinci).

Vinci is located about fifty kilometers to the west of Florence, deep in the Tuscany region. Vinci is also near Pisa (home of the famed Leaning Tower), as well as Siena and Lucca. Long before the Renaissance, Vinci was home to the Etruscans and contained many ancient castles, including the Castello dei Conti Guidi (built by the noble Guidi family during the Middle Ages). The town's rolling green countryside must have been a source of inspiration for Leonardo's budding artistic talent. Surrounded by such beauty, who wouldn't be moved to draw it?

However, not everyone thinks Leonardo actually came from Vinci. One theory holds Leonardo was actually born in Anchiano, a town located about three kilometers from Vinci. Why? For one thing, Da Vinci's family supposedly lived there. Anchiano also boasts a farmhouse that many people think is where Leonardo first entered this world, fittingly nicknamed the Casa Natale di Leonardo (which literally means "the birth house of Leonardo"). Today, the farmhouse is home to a permanent exhibit of Leonardo's drawings and other works. Restored in the mid-1980s, the house is decorated with many of Leonardo's landscape paintings—so if nothing else, it's a great place to see Leonardo's work!

Even if Leonardo was actually born in Anchiano, he clearly spent much of his childhood in Vinci. Vinci today is the home of the Leonardo Museum, which occupies part of the Castello dei Conti Guidi. The castle was converted into a museum in 1953 to celebrate the five hundredth anniversary of Leonardo's birth. The main exhibit includes some of Leonardo's machine

designs and models, including cranes, winches, clocks, and helicopters. Sketches, notes, sculptures, and other descriptions of how the machines might have worked accompany them.

In addition to this museum, there are other points of interest in Vinci. It's home to the Chiesa di Santa Croce (Church of St. Croce), which boasts Leonardo's rumored baptismal font. A new museum is also being planned; this facility will be devoted to Leonardo's paintings, as a complement to the existing museum, which focuses on his inventions.

Modern-day Vinci continues to hold yearly festivals that celebrate Leonardo and his artistic legacy. Today, the town is home to about fourteen thousand people.

The Mamas and the Papas, and Everyone in Between

As explained in this book's Introduction, Leonardo's parents were not married. Aside from that, who were these people who gave birth to one of the greatest artistic minds of all time? His mother, Caterina, was a sixteen-year-old peasant girl; his father, twenty-five-year-old Ser Piero di Antonio, was a notary. A wedding was forbidden between the two young lovers because of their class difference, and Ser Piero was quickly married off to a more appropriate mate, Albiera. Caterina also married a few months after Leonardo's birth.

Like Leonardo himself, his mother led a life of mystery. She may have been a slave of Middle Eastern ancestry. Slave ownership was common in Tuscany at that time, and slaves who had converted to Christianity from Eastern, pagan, or Jewish religions often took the name Caterina. It's even possible that Caterina was Ser Piero's slave!

While Ser Piero's father was a farmer, Ser Piero's family included lots of notaries. At that time, the position of notary was similar to a lawyer, and Ser Piero had a relatively privileged position in society. Because he was illegitimate, though, Leonardo shared none of his father's privilege. Even if he'd wanted to, he couldn't have followed in his father's footsteps. Luckily, this turned out to be the best thing that could have happened! Leonardo was free to pursue life as an artist.

Although we don't know much about Leonardo's early days, we do know his father wasn't rich enough to afford a wet nurse. Consequently, Leonardo probably lived with his mother during his first few years so that she could nurse him. Then, sometime between the age of three and five, Leonardo went to live with his father and stepmother. Notes from Leonardo's grandfather, Antonio, show that five-year-old Leonardo was living with his father at his

grandfather's house in 1457. But Leonardo spent little time with Ser Piero, who was often away on business in Florence.

So who affected Leonardo as a child? It seems that his greatest influence was his uncle Francesco. (Leonardo and his uncle were so close that Francesco even remembered him in his will.) Ser Piero's brother, Francesco, was a farmer, and when Leonardo was with him, he would have gotten to spend quite a bit of time outside. While he probably had to help tend to the animals, he would have also had time to observe and sketch nature and landscapes.

Both Caterina and Ser Piero had a number of other children, eventually leaving Leonardo with a whopping seventeen half brothers and sisters: twelve children from his father and five from his mother. Now that is one big extended family! The births of these other children were spread out over the years—Ser Piero's first legitimate son was born twenty-four years after Leonardo's birth, which explains why Leonardo was treated as a legitimate son of Ser Piero's household.

Caterina remained in the Vinci area for most of her life, although she came to live with Leonardo in Milan in 1493. She resided there with her son, until her death in 1495.

“Current Events” in Fifteenth-Century Italy

Even before Leonardo’s birth, pre-Renaissance Italy was gearing up for a dramatic shift from the Middle Ages. While most of the heavy hitters were yet to come, Italy was rapidly becoming a hot spot for invention and innovation. Many of the world’s best-known artists rose to fame in the years before Leonardo, and their efforts made Leonardo’s own success possible.

Historically speaking, fourteenth-century Italy was a mishmash of city-states. Italy still had a long way to go before it would become a single, united country—this unification didn’t occur until the mid-nineteenth century. Small political groups were constantly battling each other, leading to a fairly unstable atmosphere. Feudalism, a two-tiered system of lords and peasants, provided yet another reason for discontent. Do you think such hostility would have made it impossible for artists to break out with new styles? Not at all—artists were actually responsible for helping to reshape Western European society. Dante, Giotto, Brunelleschi, Alberti, and later Leonardo were all artists who created a cultural connection between feudalism’s two class extremes.

Let’s take a quick look at some of these pre-Renaissance masters. Filippo Brunelleschi (1377–1446) was one of Florence’s primary architects and sculptors in the one hundred or so years before Leonardo da Vinci’s rise to fame. As a young architect, Brunelleschi was known for combining elements of classical architecture with designs that reflected the Renaissance’s rising sense of independence and freedom. His major projects included the cathedral of Santa Maria del Fiore, the cupola of the Duomo, and the Ospedale degli Innocenti, all in Florence. In 1401, Brunelleschi, along with Florentine sculptor, painter, and goldsmith Lorenzo Ghiberti, won a competition to create the doors of the Florence Baptistery. (The Baptistery is one of the buildings that makes up the Florence Duomo cathedral complex.) Leonardo’s life paralleled Brunelleschi’s in many ways. Like Leonardo,

Brunelleschi was first trained in metalsmithing and sculpture. He was apprenticed early in his career, so he was able to learn new skills while honing existing ones. Also like Leonardo, Brunelleschi sketched throughout his life, including designs for different machines and platforms. He was perhaps the most prolific architect of the day, and his multifaceted approach to art and science was a great source of inspiration to Leonardo.

Leon Battista Alberti (1404–1472) was another Italian architect who helped set the stage for Leonardo. Alberti was one of the earliest Italian artists to include perspective and architectural design elements in his painting. He studied in Bologna and Padua and, like Brunelleschi, nurtured an interest in classicism. Alberti's main contribution to the pre-Renaissance era was his intense fascination with geometry. He was one of the first architects to incorporate mathematical structure into construction, interpreting three-dimensional forms as a system of proportions. His major design tasks included the Rucellai Chapel and the facade of Santa Maria Novella, both in Florence, and Sant'Andrea in Mantua.

As Italy climbed out of the medieval darkness during the Renaissance, other aspects of Italian culture began to flourish too. Dante Alighieri (1265–1321), for example, was one of this period's most creative authors, contributing such masterpieces as *The Divine Comedy*, which helped to standardize the Italian language (similar to what Chaucer's *The Canterbury Tales* did for English).

Giotto (Ambrogio Bondone, 1267–1337) was perhaps the best-known painter of the thirteenth century. Although he had a background in the Byzantine tradition, Giotto gave it up in exchange for more natural, flowing lines. Giotto is also credited with breathing life back into the art of painting: he modernized both its purpose and aesthetic, and created the illusion of 3-D space on a 2-D canvas. These changes made art more popular and revived a flagging interest in artwork. This artistic revival worked itself into the eventual frenzy of the Renaissance.

The Life You're Born Into

Leonardo's illegitimate status wasn't much of a secret: you could see it simply by examining his name. Officially, he should have been Leonardo di Ser Piero da Vinci, meaning, "Leonardo son of Ser Piero from Vinci." However, Leonardo didn't use his father's name, as was the custom of the time; he referred to himself only as Leonardo da Vinci and signed many of his works just plain Leonardo. By shortening his name even more, he was probably rebelling against his lack of official status and trying to make his own place in the world.

As an illegitimate child, Leonardo's place in the Tuscany region's highly stratified society was, at best, precarious. Class status was important, especially in the new middle classes. In the upper classes, illegitimate children could inherit property and social status from their fathers. The middle classes were sticklers for proper birth and parentage, though; as the illegitimate son of a peasant woman (and possible slave), Leonardo's status was quite low. While the upper classes in the Renaissance were probably secure enough in their status to accept illegitimate children, those in the middle class likely felt that what they had gotten could just as easily be taken away. So middle class folks were much more obsessed with status and would have made it clear that an illegitimate child like Leonardo wasn't really welcome in their ranks.

Even though Leonardo's father raised Leonardo in his household, his illegitimacy disqualified him from the clubs and guilds to which his father belonged. In fact, Leonardo couldn't get a university education, and he certainly wouldn't have been able to follow in his father's footsteps and become a notary (see [number 2](#)). While his father most likely provided a basic education in reading and writing, Leonardo did much of his learning independently. Eventually, he would teach himself Latin, mathematics, human anatomy, and physics!

With no expectations, Leonardo was free to grow into his full intellect. Because he was not obligated to follow a specific, predefined role, he was able to explore and develop his talents, without anyone pushing him to be something he didn't want to be. His early days on his uncle Francesco's farm left him with a deep love and respect for nature, as well as a sense of wonder. Through these experiences, he also discovered his talent for drawing and art.

A career as a court artist was one of the most respected occupations that an illegitimate child could hope to achieve. Perhaps Leonardo's father had this in the back of his mind when he apprenticed his son to one of the most respected artists in Florence, Andrea del Verrocchio. In any case, it's lucky for us that Leonardo's father had the presence of mind to start him off on such an appropriate path.

Siblings of a Genius

Although Leonardo was the first child for both of his parents (see [number 2](#)), he ended up with seventeen half siblings. Leonardo's father was never married to his mother, but he married four other women over the course of his life. This propensity for multiple weddings was one characteristic that Leonardo did not inherit from his father. Ser Piero's first two wives, Albiera and Francesca, both died young and bore no children. His third wife, Margherita, gave birth to two sons, Antonio (Ser Piero's first legitimate heir) in 1476 and Giulio in 1479. A girl, Magdalena, was born in 1477, but she died in 1480. Soon after her death, Ser Piero married his fourth wife, Lucrezia, who gave birth to two daughters and seven more sons: Lorenzo in 1484, Violante in 1485, Domenico in 1486, Margherita in 1491, Benedetto in 1492, Pandolfo in 1494, Guglielmo in 1496, Bartolomeo in 1497, and Giovanni in 1498. Leonardo wound up with nine half brothers and two half sisters on his father's side alone. Quite an extended family! In spite of his many options, Leonardo wasn't particularly close to any of his half siblings. By the time Leonardo's first half brother, Antonio, was born, Leonardo was already twenty-four and a working artist.

Not much is known about the five children that Leonardo's mother, Caterina, had after she was married. These children included three half sisters and one half brother (nothing is known about the fifth), who were closer in age to Leonardo than his father's other children. Records show that two of Caterina's daughters were named Piera (born in 1455) and Maria (born in 1458), and Leonardo notes in his writings that his half brother on his mother's side died from a mortar shot at Pisa. These other kids probably contributed to the distance between Leonardo and his mother. Once Leonardo moved into his father's house, Caterina most likely devoted all her time to her legitimate children, with little to spare for poor Leonardo.

After Ser Piero's death in 1504, Leonardo's half brothers got greedy over their father's property. There was much in-fighting, and Leonardo had to return to Florence a number of times to settle disputes. Apparently, Ser Piero died without a will—not very good planning for a lawyer—which basically led to a feeding frenzy among his offspring. One of Leonardo's half brothers had become a notary like his father, and he took charge of the legal proceedings. He first challenged Leonardo's right to inherit from his father's estate, and then when Ser Piero's brother, Francesco, died a few years later, he objected to their uncle's will as well. He had a good reason to protest—Leonardo was supposed to get a good chunk of land.

While all this was going on, Leonardo wasn't exactly resting on his laurels; he was the court painter to King Louis XII of France (who happened to live in Milan). Leonardo had many paintings to complete, and the king probably wasn't too happy with all these interruptions to Leonardo's work. In fact, both the French king and Charles d'Amboise, among others, wrote letters to the Florentine authorities, asking them to speed up Leonardo's legal battle. These letters didn't have much effect, however, and the lawsuits continued until 1511. Ultimately, Leonardo didn't receive any inheritance from his father's estate, but he emerged from the years of conflict with rights to his uncle Francesco's farm, land, and money.

Although none of Leonardo's siblings were particularly artistic, he did have a nephew, Pier Francesco da Vinci (1531–1554), called Pierino, who was a decent sculptor. The son of Leonardo's half brother, Bartolomeo, Pierino was apparently a child prodigy and became known as a talented sculptor before his death in Pisa at the age of twenty-three. In spite of his short career, the sixteenth-century art historian Giorgio Vasari dedicated a biography to Pierino, and one of Pierino's sculptures is in the Louvre! Maybe if he'd lived a little longer, Pierino would have shown more of Leonardo's legacy, but unfortunately we'll never know.

It's All Relative

As previously discussed, Leonardo da Vinci came from a long line of notaries—the first one in his family was Ser Guido di Ser Michele da Vinci, who lived in Vinci in the fourteenth century. His two sons, Giovanni and Piero, were also notaries, and Piero's son, Antonio, was Leonardo's grandfather. In a burst of independence, Leonardo's grandfather, Antonio, broke with family tradition and instead became a farmer. He married Leonardo's grandmother, Lucia (born in 1393), who was the daughter of yet another notary. They had three children: Piero, Leonardo's father, born in 1427; Francesco, born in 1435; and Violante, born some time afterward. Leonardo and his father lived in the same house as Antonio and Lucia for many years, until the family moved to Florence.

Fortunately, Antonio kept detailed records about his family's life. From these notes, we know that Leonardo was baptized into his father's family almost immediately after his birth. Tax records show Leonardo was part of his grandfather's household by the time he was five years old. Leonardo was still living with his father's family when he was seventeen, already a part of Andrea del Verrocchio's studio by that time.

Leonardo's uncle, Francesco, had a strong influence on his young nephew (see [number 2](#)). Grandpa Antonio's tax information shows that Francesco lived with the family for a time, though the grandfather wasn't generous with his job description; he put that Francesco “stayed home and did nothing.” Eventually, Francesco started a career as a farmer and landowner, following in his father Antonio's footsteps, while Piero became a notary like his grandfather.

Youthful Adventures

Most of us start showing signs of our adult personalities as children. Leonardo was, of course, no different. With his childhood games he would flit from one project to the next, yet when projects interested him, Leonardo could spend hours, even days, working on fine details. As you'll read later, these qualities stuck with him throughout his life.

Giorgio Vasari's biography of Leonardo records one example from childhood of the work habits Leonardo became known for as an adult. According to this report, Leonardo's father received a request from a local peasant to decorate a wooden shield, and he decided to give the project to his young son. Leonardo decorated the shield with the face of Medusa, the mythological serpent-headed creature. Rather than painting a pleasant, romanticized version of Medusa, Leonardo gathered various snakes, lizards, and other creatures from outdoors, positioning them in a studio to use as models. After a few days of work, Leonardo's father came to check on his son's progress. He was in for quite a shock! When he walked into the studio, Ser Piero was not only confronted with the shield's grotesque realism, he got hit with the stench of decomposing reptiles. As the story goes, Leonardo had been oblivious to his models' offensive smell and didn't seem to mind working amidst dead creatures.

Whether or not this story is actually true, it shows Leonardo's penchant for drawing nature accurately began when he was a child. During his youth, Leonardo probably spent hours on end observing nature firsthand, and his earliest sketches were studies of landscapes, plants, and animals. In his future artwork, he used these skills to create realistic-looking natural scenes, in both his scenes with human figures and landscape paintings.

Although his illegitimate birth barred Leonardo from most formal education, including university study, his relatives and family friends probably tutored him. Though he seems to have tried studying Latin on his

own, Leonardo never learned it very well. Not knowing Latin came with a heavy price, because it effectively prevented Leonardo from studying ancient Roman writings. Although the revival of classical knowledge was a key element of the Renaissance, Leonardo was forced to innovate largely on his own. It's possible that his poor Latin skills inadvertently helped him; he was forced to use his own innovations and thought processes, and he was almost entirely free of precedent. Sometimes it's not so bad to go your own way!

Much of Leonardo's early work focused on the interplay of light and shadow, and for Leonardo, nature truly was the best teacher. He was particularly interested in margins, such as the line between the beautiful and the grotesque. Rather than drawing or painting only beautiful things, he searched for the unusual: strange hills and rocks, odd animals, and rare plants. He also continued to study and observe humans; the incredible details he added to his drawings of faces and expressions made him stand out from the crowd.

Throughout his career, Leonardo spent a lot of time sketching and painting images of mothers with children. Hundreds of years later, Sigmund Freud theorized these works, while religious in nature, were Leonardo's attempt to deal with being abandoned by his mother at a young age. Maybe this is a stretch, but then again, maybe you can see his lack of a true maternal bond in some of his works, like the painting *The Virgin and Child with Saint Anne*. Here, the child is thought to be a self-portrait, while the Virgin and St. Anne might represent Leonardo's mother, Caterina, and his first stepmother, Albiera. Though such interpretations are only theories, they support the possibility that Leonardo's popular religious themes may have had personal underpinnings.

Get to Work! Leonardo's Early Training

Even before he became famous, Leonardo was heavily involved in the arts. Though he was in many ways a typical kid, he was already beginning to break away from the pack. Unfortunately, not many specifics are known about Leonardo's early education, but it's possible to make a few generalizations based on what we do know.

If you grew up in New York, you might have spent hours drawing skyscrapers. In much the same way, Leonardo, who grew up in the beautiful Tuscan countryside, learned to draw by studying the mountainous landscape. He used everything he had available—sketching, painting, and modeling—to record the natural environment. His grandfather's notes mention that Leonardo spent time drawing animals and plants, indicating a keen awareness of the world around him.

Leonardo got a taste for a wide variety of arts at a young age. He studied music and singing during his formative years, learning to play the lyre and other Renaissance instruments. One of his favorite “academic” subjects was probably mathematics; the ability to apply mathematical principles to art would, of course, be one of his signature trademarks later on. Is it possible that Leonardo simply had too much exposure to too many different things as a child? Leonardo was known for starting more tasks than he finished; his notebooks reveal many ideas that never actually took shape. Maybe he tried so many things that he never learned to focus on one at a time.

Perhaps not insignificantly, Leonardo was left-handed. Generally speaking, the right hemisphere of the human brain (more dominant in left-handed people) controls art, music, creativity, and emotions. In contrast, right-handed people are more oriented toward the left hemisphere of the brain, which is associated with math, science, language, and speech. Leonardo's left-handedness likely has something to do with his unusual style of writing, which flowed from right to left. He wrote letters backward, so

they formed a mirror image. You might already know someone who writes this way—this style isn't uncommon among left-handed people, and Leonardo could have devised the technique as a child. Some historians believe he developed it as a sort of secret code to protect his notes and sketchbooks from being copied; others think it was the result of being both left-handed and dyslexic. Whatever the reason, Leonardo's writing method added to his uniqueness and made his homework pretty hard to copy!

During the Renaissance, artists couldn't just run down to the corner art supply store for paints and brushes—they had to make things themselves. As a child, Leonardo probably used materials he found or borrowed from his grandfather to create his sketches. Though only seventeen years old when he was apprenticed to master artist Verrocchio, Leonardo had already shown promise. Few dated drawings survive from Leonardo's childhood and the first few years of his apprenticeship. Nevertheless, one of Leonardo's earliest known drawings, a pen-and-ink landscape called *View of the Arno Valley*, from 1473, is also one of the first drawings ever to detail landscape in a truly realistic, convincing style. Even at the beginning of his career, Leonardo was already innovating!

What Did They Do Before There Were Bookstores?

Leonardo da Vinci's early educational resources were few and far between. He certainly didn't walk to the nearest Barnes & Noble to pick up new books! Rather, most of his knowledge came from experience. As previously discussed, he spent plenty of time with his uncle Francesco as a youngster. Being a farmer, Francesco taught Leonardo much about nature. Leonardo's early interest in sketching probably began at this time.

While textbooks and teachers were scarce, Leonardo still loved to read. Though his formal schooling probably didn't go past a primary grade, he took advantage of friends' and relatives' libraries. After moving in with his grandfather, he was probably homeschooled in math, science, reading, and writing. Amazingly, he learned physics and anatomy more or less on his own.

Leonardo certainly wasn't the only artist who didn't go to college. Many others were self-educated, which goes to show that if you want to strike it big, you need to get out there and do what needs to be done. Michelangelo Buonarroti (1475–1564), another one of the Renaissance's greatest artists and architects, didn't have much formal instruction either, but he persevered and ultimately carved his own distinct place in history. Schooling or no schooling, great artists such as Michelangelo and Leonardo quickly gained skill and talent far beyond what most achieve in a lifetime.

Apprenticeship, or Learning from Your Elders

When Leonardo was sixteen (in 1468), his paternal grandfather died and his remaining family moved to Florence. This move would ultimately be of great importance to Leonardo's career; Florence was home to many of the best artists of the day, including Andrea del Verrocchio (1435–1488). Art took many forms during the Renaissance, and Verrocchio was not only a master of painting, but also sculpture, goldsmithing, music, and other arts. No doubt, Leonardo's father made a smart move by securing his son an apprenticeship with such a great master.

Florence in the mid-fifteenth century was a haven for up-and-coming artists; imagine a loose parallel to Greenwich Village in New York City. Except in those days, patrons worked more closely with artisans. Artists held high social positions, were well respected, and often mingled with powerful Italian families. By the mid-1470s, Florence was home to more than fifty stoneworking shops and close to thirty master painting studios. For a student like Leonardo, there was no better place to be.

But Leonardo wasn't the only star in the sky. Verrocchio had other students, including Sandro Botticelli. Still, apprenticeship did have its advantages for Leonardo. There was a fairly established program for the skills interns had to learn, and Leonardo studied the technical aspects of painting, including how to grind and mix pigments into various paint colors. He probably also studied color theory, learning which colors combine to form other colors, how saturation could contribute to different tones, and so on. You can't paint if you don't know the fundamentals, and Leonardo certainly learned them well.

This crucial internship covered the basics of painting on wood panels. Leonardo was probably also exposed to canvas techniques, including how to stretch and prepare canvases for painting and how different materials would accept paint in different ways. Leonardo also got his first introduction to

casting in bronze, a skill he mastered later on down the road. He certainly learned bronze casting from one of the best—Verrocchio was responsible for some of the greatest bronzes the world had ever seen, such as his *David* and his equestrian statue of Bartolomeo Colleoni. He also created bronzes of many saints, including St. John and St. Peter. In addition to metalworking in 3-D, Verrocchio produced bronze relief sculptures, quite common at the time. To put it in modern terms, Verrocchio's studio was the Harvard of the Renaissance.

Leonardo's apprenticeship in Verrocchio's studio lasted until about 1472. At that time, he was admitted to the painters' guild in Florence. Probably eager to test the waters on his own, Leonardo had the opportunity to branch out as an independent artist. But he didn't give up all ties to Verrocchio's workshop, probably because he wanted to further his education and continue his association with the master.

Collaboration on paintings was not uncommon at this time. A patron might provide the general direction for a piece of art, and sometimes entire studios (masters and apprentices) worked together on a single painting. Leonardo assisted Verrocchio with at least one of his great works, *The Baptism of Christ*, in 1472. The two artists also collaborated on other works, including the *Madonna di Piazza* (1474). Though Leonardo must have gradually evolved from a student to an equal in Verrocchio's eyes, he didn't come into his own until he started working alone.

Turning Dust Into Gold: Early Painting Experience

Leonardo da Vinci probably got his first formal exposure to artists' technical tools during his apprenticeship to Andrea del Verrocchio (see [number 10](#)). As already mentioned, artists in the fifteenth century had to make their paints from scratch. Leonardo much preferred oil paint because it allowed subtle variations in the colors that just weren't possible with tempera.

The science of mixing oil paints was intense; it certainly wasn't a simple skill. The paint had to be colored, and it also had to adhere properly to the painted surface. Paint is a type of emulsion (a liquid suspension where oil and water are mixed together, suspending the oil in the water). Look closely the next time you reach for a bottle of oil-and-vinegar salad dressing; you'll notice the seasonings floating to the top. That mixture is a suspension. Milk contains lots of fat droplets, which spread out over a glass or bottle; they never fully mix and create another type of suspension called an emulsion. Paint is a colloid, a particular sort of emulsion containing solids (pigment) suspended in a liquid (oil plus binders). Complicated stuff, and Leonardo had to learn it well!

In Leonardo's first year at Andrea del Verrocchio's shop, he likely worked as a *garzone* (a sort of servant). While he had cleaning and other menial tasks to perform, one of his most important jobs would have been making paint. At the time, pigments came from a variety of natural sources: plants and minerals provided the greatest variety of colors. Leonardo would have spent hours washing and then hand grinding local Italian minerals. Doesn't sound like much fun, but important work, nevertheless. Iron was a commonly available mineral during this period, as was terra verte (found mostly near Verona, Italy). Renaissance painters didn't have dust masks or any way to keep from inhaling airborne particles; they would just measure an amount of pigment onto their grinding surface, add water into the middle of

the pile, then start to grind. And they probably had to be careful not to sneeze!

Color alone isn't enough to make paint; you need to mix it with a medium (like oil or water) that will carry the color and dry along with it. A third substance makes the color adhere to the oil or water. During the Renaissance, most artists used animal products, such as eggs, animal glue, or milk, as binding agents to stick the paint to the wood, canvas, or wall surface. After grinding the pigments into a thick paste, Leonardo would have either added the color and the other requisite ingredients to the oil to make paint to use right away, or else he'd have stored it carefully for later use.

Leonardo improved the technique of creating oil paintings by mixing ground pigments with linseed oil and adding beeswax and water to the paint while it was in a boiling stage; this additive kept the colors light and prevented oversaturation. As you'll see later, some of his painting innovations were more successful than others. More important than the new techniques, though, was the fact that he used oil paint extensively, which caused a ripple effect throughout the artistic community. Given how successful his paintings were, it's not surprising that people wanted to copy his techniques!

In addition to painting, Leonardo almost certainly learned how to make and draw with chalk while apprenticed to Verrocchio. In Renaissance Italy, mineral chalks were dug out of the ground and fashioned into drawing tools. Red and brown chalks (common earth tones) were the most popular, and Leonardo used those most in his later chalk drawings.

Getting Off to a Good Start

Leonardo's period with Verrocchio (1468–1472) was his first foray into professional art. While apprentices often worked with their masters on commissioned projects, most of these students didn't go on to outshine their teachers! Then again, most of the students weren't Leonardo da Vinci, either.

The first real tip-off to Leonardo's talents came when he worked on a painting called *The Baptism of Christ* (1472–1475). Verrocchio was the official painter, but Leonardo also took part. The monks from the Florentine church of San Salvi requested the painting, and many members of Verrocchio's studio worked on it. Though apprentices like Leonardo had to do office duty and other routine tasks, they also got to help on the master's jobs. In this painting, Verrocchio probably painted Christ and John the Baptist. Although written documentation is slim, it's thought that Da Vinci did some of the landscape and added a kneeling angel supporting the mantle. This figure appears more lifelike than the others; the angel's expression, hair, and clothing are particularly detailed. The angel in question was also painted in oil, Leonardo's paint of choice, whereas much of the remainder of the painting was done in tempera.

Using diagnostic technology to examine this painting, historians have essentially proved that Verrocchio did a master sketch before applying paint. From these tests, you can see that Leonardo strayed from this overall scheme and took liberties with his portion of the painting. You can also see that Leonardo's rendering of the landscape, full of shadows and bright sunlight, is different from the parts Verrocchio painted. Even at this early point in his career, Leonardo was using his own creativity and invention rather than simply following orders. That kind of attitude worked because he was highly skilled. Still, we'll never know if Verrocchio was angry or pleased with Leonardo's changes to his initial design.

Leonardo often made clay study-models of figures before committing them to canvas or wood. In the case of the angel in this painting, Leonardo probably made a clay model and then painted from the model. This technique might explain the apparent stiffness in the folds of the cloth draping Leonardo's angel, but it speaks volumes about Leonardo's willingness to experiment. And, of course, Leonardo was right—the best way to learn to paint something is to study it in 3-D!

While Verrocchio's work didn't exactly pale in comparison to Leonardo's, it was clear from this early work that Leonardo's painting abilities would eventually surpass those of his master. In fact, one story (which may or may not be true) has it that Verrocchio actually swore to give up painting when he saw Leonardo's work, since he knew he could never be that good! But even if that story were true, Verrocchio was an artist skilled in many areas, and he could just as easily have focused his talents on metalsmithing, sculpture, and bronzing. Fortunately for Verrocchio's ego, Leonardo didn't develop his skills in those areas until later!

Besides Verrocchio and Leonardo, a number of other well-known collaborators, including Sandro Botticelli and Lorenzo di Credi, were involved with the creation of *The Baptism of Christ*. Many of these artists would eventually become famous in their own rights. This masterpiece remained at the monastery in San Salvi until 1530, and it currently resides in the Uffizi Gallery in Florence.

Membership Has Its Privileges

With the success of *The Baptism of Christ* (see [number 12](#)), Leonardo's confidence probably hit a high point. His work was recognized far and wide, and this realization may have given him a push to leave Verrocchio's studio and strike out on his own. Though most artists based their own styles on those of their masters, Leonardo was clearly branching out and discovering his individual talents.

In 1472, Leonardo joined the painters' guild. The notion of the guild (an association, usually for either religious, craft, or business purposes) had been around since the first century, but guilds became more popular during the Middle Ages. Guilds gave artists opportunities to get together, share techniques, and provide mutual protection. They were a common resource for patrons too.

The main types of guilds in the pre-Renaissance era were merchant and craft; merchant guilds were for businessmen, and craft guilds were for painters, architects, sculptors, and other artists. A cross between a club and a users' group, guilds provided a common interest base and promoted the development of specific trades. Generally speaking, each major city had a guild for each art. And these guilds weren't just social affairs! In some cities, guilds would design entire public-works projects.

The painters' guild had many benefits for its members—for starters, there was the prestige and credibility. For another, guilds increased artists' visibility to potential patrons. And not anyone could just walk up and join; these artistic guilds were selective, women being perhaps the most obvious exclusion.

For Leonardo, joining the guild was a big deal. While he kept working out of his master's studio, enrollment in the guild gave him a higher status and enabled him to receive commissions both individually and as part of the guild. But the honor of belonging to a guild certainly didn't come free. The

guild's record books show that Leonardo was behind on his dues at least once. In typical fashion, Leonardo rebelled from within; he came out in favor of educating artists through schools, rather than apprenticeships and guilds.

Leonardo was prolific in this early period, producing many sketches and paintings. One of the first dated works attributed to Da Vinci is a pen-and-ink landscape drawing of the Arno River valley. This sketch, from 1473, was one of many that Leonardo created before he became famous. The Uffizi Gallery in Florence contains several of the paintings Leonardo created between 1472 and 1475; one such work is the *Annunciation*, a religious scene that combined oil and tempera on wood. The National Gallery of Art in Washington, DC, houses other Leonardo paintings, such as *Portrait of a Lady* (1500) and one of his early portraits, an oil painting on wood of Ginevra de' Benci. Even in these early works, you can see Leonardo's innovations and genius. Not bad for a twenty-two-year-old!

Striking Out on His Own

After five years with the guild, Leonardo opened his own art studio in Florence. While he still kept close ties to Verrocchio, he began establishing his own identity, splitting from Verrocchio on several major issues. For example, while Verrocchio was a master of tempera, Leonardo preferred working with oil paint. Leonardo thought that oil paints had a more natural glow, and they also increased his ability to mix colors. His apprenticeship with Andrea del Verrocchio gave Leonardo both the confidence and the reputation to join the guild; the experience he gained with the guild likely spurred him to branch out further by going to work for himself. In modern-day terms, Leonardo's striking out would be equivalent to working for a large corporation, and then taking out loans to begin a start-up company.

During his first years with the guild, Leonardo was still working with Verrocchio's studio on many projects. Records indicate that he either assumed more of a financial-management role with Verrocchio's jobs, or he actually had several of his own commissions within the studio. Never one to turn down work, Leonardo may have also worked with Antonio del Pollaiuolo's neighboring studio on projects.

Leonardo's work during this period includes sketches he made around 1478 of an angel, which could be based on his angel from Verrocchio's *The Baptism of Christ*, done several years earlier. Many paintings of the Virgin Mary done during this period have been attributed to Leonardo as well. Of particular interest is a vibrant *Madonna and Child* from 1478 that shows incredible attention to detail and human facial expression. Leonardo's *Ginevra de' Benci* (1474–1476) portrait, mentioned in the previous section, was one of his first surviving Renaissance portraitures. This oil-on-wood painting shows a woman with incredibly detailed curls in her hair and a facial expression that suggests she may have been used as practice for Leonardo's later work on the *Mona Lisa*.

The *Madonna and Child with Flowers*, also called the *Benois Madonna* (1478–1480), is one of two Madonna paintings (the other being *Madonna of the Carnation*) Leonardo worked on during this early independent period. This oil painting again demonstrated realistic human features with a rich depth of expression, apparent especially in the Madonna's facial and hand gestures. And like many of Leonardo's other artistic endeavors, this work appears to be partially incomplete. Further, in this painting, lighting appears to be coming from both behind and in front of the window, indicating that Leonardo was experimenting with the advanced painting techniques he would later refine. The innovations in Leonardo's early works are often copied throughout his career—when he found something that worked, he refined it and then used it over and over again.

Leonardo's period of self-employment was short-lived at this point. Devoted as he may have been to his art, Leonardo still had to eat and pay the bills. He didn't yet have a full-time patron, and no one would pay him just to sit around and draw for himself. Then there was the issue of handing projects in on time—something that plagued Leonardo throughout his career. Although he had a good reputation from the start, he was also known for starting more projects than he finished, and most patrons preferred a completed work to an idea or sketch—especially when they were paying for it! As it turns out, the artist-in-residence option fit Leonardo better than individual commissions. When just one patron employed him, Leonardo had much more leeway in his work. Leonardo went on to work for many important people over the course of his life, and his art developed with each change in patronage.

The Rebirth of Italy

The Italian Renaissance is a truly unique part of history—it impacted society in just about every way possible, from the culture and art of the day to the religious and intellectual atmosphere. As a bit of background, Italian city-states of the fourteenth century were very different from each other: They were ruled separately, and this often created situations where one city would have enormous influence over the surrounding areas. At the beginning of the Renaissance, the main centers of power were Florence, Milan, Venice, Naples, and the region around Rome ruled by the pope. As the Renaissance spread and produced more interaction and communication between city-states, it also provided the means to create a more united Italy, and a more unified Europe.

Pre-Renaissance city-states were economically mixed. Generally speaking, rich people lived in the cities and poorer ones lived in the country. Gradually, however, the wealth spread out. As bankers and other merchants became wealthy, classes other than nobility were coming into money for the first time.

The Early Renaissance really began in Florence. There, some of the wealthiest members of society started supporting humanities and the arts. Writing, painting, sculpture, architecture, and science were all fields that were suddenly in the public eye. The Medicis were one of the most influential families during the Renaissance and would turn out to be one of Leonardo's many patrons. Lorenzo de' Medici (1449–1492), son of Cosimo de' Medici (one of the period's wealthiest Italians), gained popular acknowledgement and support by funding art and architecture.

In spite of newfound money and culture, life was not entirely peaceful during the Renaissance. In 1454, Milan, Florence, and Naples were united under the Treaty of Lodi, through which each city attempted to ally itself with the others. But thanks to Pope Alexander VI's scheming goals, the French

king Charles VIII headed up an Italian invasion and several areas were conquered as a result.

Then, in 1495, King Ferdinand of Spain got involved and helped to create the League of Venice, which included Spain and other Italian city-states. France invaded Italy on several other occasions during this period, contributing to the political unrest so characteristic of the Renaissance. The popes of this era (Alexander VI, Julius II, and Leo X) served mainly to enforce a Christian system of beliefs throughout the country, in part by preventing an Ottoman invasion. By 1527, the Holy Roman Empire had taken over what was left of the city-states and Papal States.

Let's get back to the great cultural strides made during this period. Humanism was the Renaissance's most important conceptual innovation. This idea of a human-based study included a revival of classical beliefs from ancient Greece and Rome.

The hallmark characteristics of the Renaissance peaked between about 1490 and 1527, when German and Spanish imperial troops sacked Rome. This period, when Leonardo da Vinci did much of his work, is usually called the High Renaissance because it represents a culmination of all the ideas that had been floating around Florence in the previous years. The main idea was that beauty could be achieved by combining classical forms with landscapes, cityscapes, and other "natural" elements. Unlike the Early Renaissance (which centered mostly around Florence), other parts of Italy, including Rome and Milan, felt the High Renaissance's influence.

In addition to Leonardo da Vinci, other famous artists of the High Renaissance include Michelangelo Buonarroti and Raphael (1483–1520). Like Leonardo, Michelangelo and Raphael both studied in Florence and worked in painting, architecture, and other arts.

Renaissance Religion

The Renaissance had the biggest impact on the humanities, arts, and sciences. As with everything in Europe at that time, however, there were also religious implications. The Papal States (regions run by the pope, who served as the bishop of Rome) were as important politically as the city-states, which included Florence and Milan.

At the beginning of the High Renaissance, Pope Julius II (reigning 1503–1513) was in power. Though a religious figure, religion wasn't the only thing he influenced! Julius II's goals were also politically and geographically motivated. He strove to remove the French from Italian territory before they could completely take over the Italian papacy. By 1512, Italy had joined Spain in the Holy League and the countries united to defeat the French, thus scoring a victory for both Christianity and Italy.

During this period, popes were often expelled for bribery or other treacheries, but their power was usually restored. To this extent, religious leadership was consistent but not absolute. Popes also often handed their office over to close friends and family members, and this culture of nepotism contributed to the unrest. Further, popes led privileged lives and had access to luxuries that much of the population would never experience. Consequently, although they were respected and feared for their connections to God, people looked at them with suspicion. High-level politicians would even marry off their daughters to popes or papal families. Lorenzo de' Medici, for example, had his daughter, Magdalena, marry a pope's son. Not a bad way to ensure a solid connection between religion and government!

A fragile stability was reached during the early sixteenth century, and by the middle of the sixteenth century, virtually all of Italy was at least nominally Roman Catholic. The Roman Catholic Church's corruptions were apparent, however. The close union of religion with politics and wealth dismantled the very nature of the Church as an institution of holiness. People

were also dissatisfied with the emphasis the Church placed on ritual, rather than personal prayer. Then, in 1517, Martin Luther (1483–1546) unknowingly sparked the Protestant Reformation when he nailed his Ninety-five Theses to the door of the Castle Church in Wittenberg, Germany (see [number 82](#)). The Protestant Reformation attempted to transform the Church by calling for a return to the Bible's teachings. Since religious revolution was a popular idea at the time, people from all over Europe joined in support. Because of the Reformation, the Church was ultimately forced to revise its close dependency on outside groups. But the Reformation also caused a split in the Catholic Church, as new Protestant groups such as Lutherans and Anabaptists were created.

It's amazing to think that Leonardo and other Renaissance artists were creating their masterpieces amid all this political turmoil and religious unrest. Even though the Church was still entrenched in its strongholds from the Middle Ages, the Renaissance helped artists to break from tradition and, in many ways, address their art in a more personal fashion. The Protestant Reformation gained strength as Leonardo neared the end of his life, but the general feeling of social unrest remained prevalent throughout his most productive years.

Don't Forget the Golden Oldies

While the Renaissance celebrated humanism and individual abilities, it was also an era that remembered the past. Classical Greek and Roman antiquity was reborn during the Renaissance. People believed that the ancient Greeks and Romans had gotten things right: their art had rules—and good rules at that. The certainty of the classics provided a calming effect that Leonardo and his contemporaries were desperate to incorporate during such troubled times.

One of the most attractive elements of this classical revival was a sense of beauty and proportion. Classical architecture used balance and harmony for its aesthetic appeal and symbolically religious nature. Inner and outer beauty were equivalent in classical sculptures. Greek statues were notoriously well proportioned, a balance that was created in order to please the gods and, by association, the surrounding world.

The idea of balance extended to architecture as well. Classical temples with ordered plans and symmetrical columns produced a sense of order that Renaissance architects tried to recapture. Three major Greek orders, or architectural styles, emerged, providing a clean way to organize form and structure. The three orders, Doric, Ionic, and Corinthian, are best known for the columns with those names. Because classical temples were completely devoted to the gods for whom they were named, their proportions had to be symbolic of the gods' perfection. The idea was that an ordered space should project that order onto its inhabitants, sort of like a clean desk inspiring you to work more efficiently.

There was a bit of nostalgia at work here too. When it came to looking back to the antiquities, Renaissance artists adopted the familiar “grass is always greener on the other side” philosophy. In their view, Greek and Roman culture provided strong role models, little apparent corruption (at least compared to what Renaissance artists faced), and some vague notion of

a glorious past. These were strong ideals, and Leonardo and his contemporaries embraced them eagerly. The Renaissance Church was, of course, still a powerful influence in the lives of fifteenth- and sixteenth-century Italians, and maybe its strong presence stood in stark contrast to the perceived serenity and order of their Greek and Roman predecessors.

Reading and writing in classical languages such as Latin was popular during the Renaissance. Although Leonardo probably wasn't able to study original Latin texts, many of his works do show a careful study of classicism. For instance, his *Adoration of the Magi* has architectural elements in the background that show a distinctly classical influence. Similarly, *Annunciation* uses Greek-like cornerstones, as well as other architectural elements, which likely came from Leonardo's interest in the classics. He did, though, add a Renaissance twist by giving the stones rough surfaces and pronounced joints instead of a smooth, classical-era finish. How typical of Leonardo to take an established style and make it his own! Another of Leonardo's major works, *The Last Supper*, uses a careful sense of proportion and symmetry to reflect a divine influence—certainly appropriate for the subject matter. This idea was actually derived directly from Greek and Roman design and construction methods.

Show Me the Money!

The start of the Italian Renaissance also meant the restoration of trade, which had almost completely dried up during the Middle Ages. As populations grew and prosperous city-states expanded in Italy, England, and France, trade increased as well. The first order of business was shipping luxury goods from the Mediterranean to Italian port cities such as Pisa, Genoa, and Venice. Situated between western Europe and the Mediterranean, Italy was in a great location to become a major trade center. These port cities got bigger and wealthier as trade increased, which in turn caused changes in many aspects of society, including art and finance.

As trade increased the flow of money through Italy's port cities, those with secondary industries such as banking started to flourish. Florence, Leonardo da Vinci's home region, became Italy's central banking city in the early fourteenth century, which included the bank of the influential Medici family. Although based in Florence, the Medici's bank had branches in other cities across Italy and the rest of Europe. The bank financed a variety of projects, and its substantial profits were invested in the political and cultural life of Florence and other Italian cities.

As commerce grew, people in the trading and banking industries came to towns to interact and profit. Trade opened up the world beyond the confines of traditional town walls, and openness to new ideas and innovations spread to other parts of society. Towns and cities grew, and peasants migrating to towns from the countryside helped to create a new class structure. These former country folks became the working class, whereas the noble people and wealthy merchants became the ruling class. These urban elite led the Renaissance's political and cultural changes, while the rural poor participated very little.

The closing of trade routes to China during the Italian Renaissance also had a big economic influence. Beginning with thirteenth-century Venetian

explorer Marco Polo and his famous trip to China, Italy established complicated routes to China and the Far East to trade luxuries like spices and silk. However, when the Ming dynasty came to power in the fourteenth century, China closed trade with outsiders. Suddenly, the wealth and resources that would have previously gone into foreign trade were instead available for projects within Italy. The rich ruling merchant class began to invest in Italian society, commissioning myriad works of art and architecture that enriched the culture. Individual artists who received these commissions, like Leonardo, also benefited from this process.

Another innovation, the printing press, had a large effect on the spread of knowledge during the Renaissance. In 1452, the printing of Johannes Gutenberg's famous Gutenberg Bible served as an early example of movable type's possibilities (see [number 61](#)). While Germany took the early lead in printing efforts, Italy soon took up the challenge, establishing presses that printed affordable copies of classical texts and other works. Suddenly, knowledge was easier to spread—libraries could serve as repositories for information, and people could afford to buy printed books instead of expensive hand-copied volumes. Leonardo da Vinci, among many others, gleaned much knowledge in his early years from the volumes of books available in his family's and friends' libraries. And he definitely put this knowledge to good use.

The Importance of Being Sponsored

Everyone knows about the stereotype of the starving artist. Even during the Renaissance, when artists were important members of society, patronage was one of the only ways an artist could earn a living while devoting himself to—you guessed it—making art. While some Renaissance artists had to find other work to pay the bills, many searched high and low for a patron—someone to sponsor their artistic development. And having a patron was much better than the Renaissance equivalent of waiting tables!

The idea of having the Church or other groups sponsor artists and particular artworks began well before the Renaissance. In medieval times the Church sponsored many religious works of art, and during the Middle Ages there were groups of secular politicians (kings, noblemen, and princes) who would come together in sponsoring artists to create both religious and secular works.

The Renaissance took patronage to a new level. In some cases, a wealthy individual would bring an artist into his home, providing food and shelter in exchange for art. Alternatively, a person or group would commission a particular work of art, and the artist would be employed until the work's completion. Depending on the size and scope, these commissioned works could take years to finish. In that respect, these two types of patronage were sometimes nearly equivalent, although commissioned artwork gave the artist more independence than the artist-in-residence option.

Religion was one of the most significant reasons for art's popularity during this time. Sponsoring a religious work of art made you appear more pious, putting you in good stead with the Church and conferring greater prestige on your family. Wealthy families lived in the public eye; to be perceived as wealthy, people had to surround themselves with beauty—particularly beauty created expressly for them. The ability to afford commissioned artwork was a sign of power, and Renaissance politicians and

other leading figures were not shy about flaunting their wealth. Leonardo appeared, for a time, to be happy to oblige the wealthy in this endeavor. And who can blame him? If nothing else, it probably paid well.

Patronage was also a matter of simple aesthetics. In a world before television, movies, and popular culture, appreciating fine sculpture or painting was a pleasure for many people. Those who could afford art created by the masters chose to support it, and in return they were able to surround themselves with the most incredible and skilled art of the period.

In addition to wealthy individuals (including kings and political figures), collective patronage was also popular during the Renaissance. For example, the wool guild patronized artwork in the Florence Cathedral and sponsored a competition for the design of the baptistery doors. Not too different from corporate sponsorships of cultural events today!

The relationship between patron and artist was usually quite formal. Most of the time a contract was involved, requiring the artist to create a specified number of pieces. Some patrons, particularly ones with a lot of cash to throw around, sponsored artists to work more or less at their whim. If this arrangement worked, then everyone was happy; if the obligations of the contract weren't met, however, patronage could be terminated and the artist would be dismissed. Many different patrons sponsored Leonardo over the course of his life. While in most cases he was likely terminated for reasons beyond his control, it's also possible that Leonardo ended some of the relationships on his own.

Generally, when artist and patron argued, it was over money—as in the artist wanted a raise but the patron didn't want to shell out. In Leonardo da Vinci's case, there were lots of arguments over his inability to complete projects. You can't blame the patrons for wanting what they paid for. In some cases, the style or content of a particular work sparked disagreements. Early in the Renaissance, patrons more or less had complete control over their artists. As the Renaissance progressed and art became more highly valued, however, artists demanded more freedom when it came to their work.

Lorenzo the Magnificent

Want a way to enhance your political reputation? Today's politicians might support a worthy cause, but it was different during the Renaissance. Back then sponsoring an artist was all the rage. Some patrons would actually specify the quantity of gold, silver, and other precious metals they wanted artists to include in their paintings! These measurements assured patrons of bragging rights for having the most expensive sculpture or the most precious painting.

In Renaissance Florence, the Medicis were the most important political family (see [number 15](#)). The richest family in Italy (and perhaps in Europe), they spent a great deal of money building churches, supporting art, giving to charity, and constructing family monuments to ensure their continued political and social control. They were like Renaissance Vanderbilts or Rockefellers. During Leonardo's time, Lorenzo de' Medici (also known as Lorenzo the Magnificent) ruled Florence. Thanks to Lorenzo's avid support of the arts, Florence rose to a central position in the Renaissance artistic world. As the cultural center of Europe, Florence also became the founding location of the new humanist movement. Florence was certainly the place to be!

Under the Medici family, patronage grew to include more than just single works of art. The Medicis commissioned not only gardens, fountains, and public sculptures, but also residences, government centers, fortified compounds, artistic institutions, and even intricately staged public events. Was there anything they didn't commission? When you're the richest family in Europe, you get what you want.

By 1480, Leonardo had established his own studio in Florence and became well known enough to acquire a patron. He became a member of the garden of San Marcos, which was under Lorenzo de' Medici's patronage. (Lorenzo was Michelangelo's patron as well.)

During this time, Leonardo was commissioned to paint *Adoration of the Magi* for the monastery altar of San Donato a Scopeto. The scene shows the Three Kings along with Mary and her infant son. Although Leonardo was given more than two years to work on this piece, even that wasn't enough time. He managed to finish enough of it to show that he was well on his way to breaking away from Verrocchio's influence. The style is different from his previous works, with a triangular grouping of people in the foreground and an elaborate background that combines natural and architectural elements. While many works of the day were composed linearly, a straight line was just too boring for Leonardo. *Adoration of the Magi* has a balanced, symmetrical structure, again showcasing Leonardo's rapidly developing independence.

While under Lorenzo de' Medici's patronage, Leonardo worked on other paintings such as *San Gerolamo*. Unfortunately, this patron-artist arrangement did not last for long. Leonardo was a strong-spirited artist with a reputation for not finishing everything he started, and Lorenzo the Magnificent expected his sponsored works to be completed. With a name like Magnificent, you expect things to be done your way! After a few years, it was time for Leonardo to move on.

Playing Up to the Duke

In 1482, Leonardo applied for patronage with the soon-to-be Duke of Milan, Ludovico Sforza. Like the Medici family in Florence, the Sforzas controlled Milan at this time. However, unlike the banking Medicis, the Sforzas were warriors. Some members of the Sforza family were actually *condottieri*, mercenary soldiers who fought in wars for the highest bidder. The Sforzas rose through the military classes over time, eventually gaining control over Milan from about 1450 to 1535. Just imagine the young Leonardo trying to find his place working for them.

Ludovico became duke in 1494. Although he initially aligned himself with the French king Charles, he later fought against France in an attempt to protect Milan. Duke Sforza was certainly quite a warrior, at one point making weapons from up to seventy tons of bronze that had previously been earmarked for one of Leonardo's sculptures (see [number 29](#)). Leonardo couldn't have been too pleased about that turn of events.

Leonardo likely learned about military equipment and machinery during his tenure under the duke. He became Ludovico's court painter, a relationship that lasted until 1499. In that year, Sforza's land was invaded and he was forcibly driven out of Milan. King Louis XII of France invoked a claim on Sforza's property, and Ludovico ultimately died in a French prison. So much for the great warrior, and for Leonardo's great patron.

While Sforza spent a lot of time embroiled in political turmoil, he made a point of investing in the arts and especially in Leonardo da Vinci. Under Sforza's patronage, Leonardo created some of his most famous works. When applying for the job with Sforza, Leonardo wrote a detailed list of his engineering and military credentials, with his artistic skills listed almost as an afterthought. Fortunately, Sforza took advantage of all of Leonardo's talents!

Leonardo came into his own while under the Duke of Milan's patronage. He got the chance to experiment with painting, sculpture, weapons design, architecture, and machinery. Leonardo was an artist, but he was also a realist; he understood the necessity of defense, even though he didn't agree with the concept of war. Of course, he also didn't want to alienate his sponsor. As the duke's chief military engineer, Leonardo invented several different war machines and weapons during this period.

Beyond his military inventions, Leonardo created two of his most famous paintings while in Milan. He started *The Virgin of the Rocks* in 1483, a painting intended for the altar in the chapel of the Immacolata, located in the church of San Francesco Grande. The contract was extremely specific: the monks wanted the painting to be composed in a certain way, and it had to be done using certain materials. The notoriously individualistic Leonardo quickly ran into problems (see [number 36](#)).

During this period, Leonardo also began work on *The Last Supper* (see [number 37](#)). Commissioned by the Duke of Milan himself, this work was to be painted on the refectory wall of the family chapel, the church of Santa Maria delle Grazie in Milan. The giant mural was almost thirty feet long—pretty amazing that it was actually completed. However, it began to deteriorate almost immediately, most likely due to the type of paints Leonardo used and the extreme humidity of the refectory's walls. Many attempts were made to restore it over time, culminating with a painstaking effort finished in 1999.

Look Out, It's Cesare Borgia!

One of the Renaissance's more notorious political figures, Cesare Borgia (the Duke of Valencia) lived from 1476 to 1507. Born out of wedlock, he was actually the son of Pope Alexander VI. Initially, Borgia set out on the path to become a cleric, but he wound up as the archbishop of Valencia (modern-day Spain) while his father was traveling down the road to the papacy. Supposedly one of his father's favorites, Borgia probably used his family connections to obtain several official positions.

You may recognize the name Cesare Borgia as the murdering Renaissance politico who killed his own brother. Rumor has it that he did indeed murder his sibling, Giovanni, in 1497. There isn't much proof, although Cesare was said to have been jealous of his brother's high social position, and may have also fought with him over a woman. He had a violent reputation and may have been responsible for several other murders. Sounds like an all-around nice guy, right?

In 1498, Borgia did an about-face, changing his unruly ways after assuming the role of general of the Church. Because he was the illegitimate son of a priest, he had a hard time finding a suitable royal bride, so he spent much of the following year traveling, promoting his career, and dealing with various responsibilities. He also led the efforts to unite the fighting Italian city-states.

By the early 1500s, Borgia owned land all over Italy, at least part of which he had taken by force. He was quite a character—in between the murdering and the stealing, somehow he found time to be crowned Duke of Romagna for a period! As his power grew, so did his enemies. When his father died in 1503, Cesare was forced to leave Rome. It all went downhill from there. His power slowly waned, his lands were overtaken, and his castles fell into his enemies' hands. Borgia was imprisoned on several

occasions, and in a fitting end to a life of crime, he was killed while attempting to take over a castle in 1507.

Needless to say, Cesare Borgia's infamy guaranteed him a place in history. Renaissance writer and philosopher Niccolò Machiavelli (1469–1527) may even have based *The Prince*, his political examination of the day's monarchy, on Borgia's life. It is also possible that Machiavelli's work was more parody than praise; in any event, Borgia's contemporary influence was enormous and undeniable.

So how did this ruthless character relate to Renaissance master painter Leonardo da Vinci? For starters, Leonardo traveled with Cesare Borgia in the early 1500s. As a military engineer and architect, Leonardo was put to work designing war machines. When his former patron, Duke Sforza, was driven out of Rome, Leonardo had to look for work, and the military experience Leonardo gained while working under the duke helped him to secure the position with Borgia's army. During his time with Borgia, Leonardo designed many machines, including collapsible bridges, wall-mounted ladders, and rotating scythe blades attached to moving chariots. It's also possible that he designed weapons, such as catapults, crossbows, machine guns, and cannons. Leonardo's genius turned lethal, when required.

Like so many religious and political figures of the day, Borgia was also a patron of the arts, and having Leonardo da Vinci in his company was another feather in his cap. Leonardo stayed with Cesare Borgia until his return to Milan in 1506.

The Best of the Louis

King Louis XII of France (1462–1515), affectionately dubbed “Father of the People,” was a popular king who had a major influence during the Renaissance. In a typically nepotistic fashion, he inherited a duke position from his father, the Duke of Orleans. Like Leonardo, he stood up for what he believed in as part of the rebellion against the French king Charles (who was, incidentally, his cousin). This little incident landed him in prison from 1487 to 1490, but later he worked his way back into Charles’s circle of friends. How forgiving!

But how’d he end up in Italy? At that time, many powerful French leaders were asserting their claims to dominance in Italy. Louis was part of this movement, and he made a name for himself by participating in the Italian invasions. He went on to become king upon Charles’s death in 1498.

After gaining power over Milan in 1500, Louis had the unenviable task of dividing the royal authority in Naples and engaging in constant battles for power with Spain. He also had to suppress the Italian city-states’ various rebellions, including those in Genoa and Venice. Around 1511, however, Pope Julius II formed the Holy League, one of its main purposes being to eradicate French leadership in Italy. Louis remained in power in Milan until 1513, when the French presence was driven out. In 1514, King Louis’s second wife died, and he remarried Mary Tudor, King Henry VIII’s eighteen-year-old sister. When Louis XII died in 1515, the French monarchy went to Francis I.

As king, Louis was popular among the people because he lowered taxes and made other general improvements. He was also a patron of the arts, and Leonardo da Vinci served as his court painter in Milan for several years.

After his stint as Cesare Borgia’s military engineer, Leonardo returned to Milan. He was becoming increasingly famous, and King Louis’s governor, Charles D’Amboise, requested him specifically for the position of court

painter. Leonardo's reputation was well established by this time, and King Louis's court wanted to get in on the national treasure that Leonardo was becoming. You can tell that Leonardo was in high demand from a letter King Louis's court sent to the city of Florence, asking for Leonardo's services. Hard to imagine Queen Elizabeth of England writing to the mayor or city council of New York to ask for a painter, isn't it? King Louis wanted Leonardo to remain in Milan until his highness could set up court there, and of course Leonardo obliged.

In addition to painting, Leonardo provided architectural, military, and other engineering services to King Louis. He was also responsible for other general duties as directed by the court; when Louis traveled to other cities, Leonardo may have been in charge of decorations and whatever traveling road show the king required. All in all, it was a very sweet deal for our master painter.

Leonardo painted several masterpieces during this period. In 1506, he worked on a second version of *The Virgin of the Rocks*. He also painted *Leda and the Swan* (now lost) and *The Virgin and Child with Saint Anne* in 1509, as well as *St. John in the Wilderness* from around 1510 to 1515.

Leonardo also took this opportunity to do some prefunded, independent study. He was fascinated with botany, hydraulics, mechanics, and other sciences. He took his study of anatomy to a higher level, and in working with the noted anatomist Marcantonio della Torre from the University of Pavia, he learned much, storing his knowledge away for future use in paintings, writings, and other designs. But Leonardo did more than just study. In 1512, he produced one of his first self-portraits. Then, of course, there were the legal distractions related to settling his father's and uncle's estates (see [number 5](#)).

Leonardo remained Louis XII's court painter until the king was forced out of Milan in 1513. At this time, Leonardo left Milan briefly and found work in Florence and Rome over the next several years.

Don't Mess with the Pope

One of the most important political, social, and religious units in Florence, the Medici family controlled the republic more than the government possibly could have. While the family was historically composed of doctors and artists, they later became bankers and ran the region financially.

In the early sixteenth century, Giovanni de' Medici, son of Lorenzo the Magnificent, rose to be a cardinal in the Roman Catholic Church. But the Medicis certainly weren't the only powerful family in Italy. Other families challenged their financial and cultural control, but Giovanni used his connections with the pope to reassert the Medicis as a primary ruling family. Ultimately, Giovanni became Pope Leo X. His greatest claim to fame, incidentally, is being the pope who was responsible for Martin Luther's excommunication during the Protestant Reformation.

Giovanni's brother, Giuliano de' Medici (1479–1516), was also a great success as head of the pope's army. Art historians in particular like to study Giuliano because he served as Leonardo da Vinci's patron from 1513 to 1516. After King Louis XII of France was forced out of power in Milan in 1513, Leonardo was freed from his role as court painter and quickly got back on good terms with the Medici family.

Leonardo da Vinci's lifestyle underwent major changes during these years. He moved to Rome and lived in the Vatican, where he earned respect from both religious authorities and other artists. Respect equaled more commissions, so he was making friends in the right places. He had his own workshop in Rome and took on many projects under the direction of both Giuliano de' Medici and the pope.

Having such a high position gave Leonardo luxuries that other artists didn't have; he had free time to study, and he focused his efforts on learning more about anatomy and physiology. During the course of his studies, Leonardo became convinced of the scientific importance of dissecting human

cadavers. This approach certainly made sense, given what Renaissance doctors and scientists were beginning to understand about the human body. However, much to Leonardo's dismay, the pope issued orders expressly forbidding the dissection of human bodies. Faced with no other choice, Leonardo reluctantly obeyed.

While in Rome, Leonardo was in close proximity to some of his primary rivals. Both Michelangelo and Raphael were becoming major players in the art world, and while Leonardo didn't have much direct contact with these artists, their obvious abilities certainly prodded him to keep up with, if not surpass, them.

Da Vinci created several masterpieces while under Giuliano de' Medici's patronage. One of his crowning achievements was *St. John the Baptist* (1513–1516), which may be the last painting Leonardo ever worked on. This painting is particularly significant because it clearly demonstrates sfumato, a technique Leonardo developed over the course of his career to make people and objects appear to dissolve into one other and the accompanying background (see [number 30](#)). You can see another excellent example of sfumato in Leonardo's *Mona Lisa* (1503–1506).

Among Leonardo's later technical achievements during his period in Rome was a mechanical lion he developed for the coronation of France's successor to the crown, King Francis I. Following the coronation in 1516, Leonardo again joined the royal courts, serving under Francis, until his death in 1519.

Francis I, King of France and Friend of Leonardo

After his years of travel with Cesare Borgia and his army, Leonardo probably needed a break. He was, after all, in his fifties at the turn of the century, and the nomadic warrior lifestyle wasn't exactly restful. As explained in the previous points, Leonardo's occupations after moving to Milan were varied: he worked as court painter, engineer, architect, and all-around artist for Louis XII between 1506 and 1513. Then the Medicis were his patrons in Rome until 1516.

From 1516 until his death in 1519, Leonardo worked for the court of Francis I (1494–1547), the King of France. Francis was crowned in 1515 after he inherited the monarchy from Louis XII. Often considered to be the first true king of the Renaissance, Francis was enchanted with the artwork of the day, and he reportedly invited Leonardo to visit the French court and ultimately convinced him to stay. Once there, Leonardo was honored and respected, as well he should have been! Rather than being simply a court painter, he was given the title of Premier Architect, Engineer, and Painter.

While some of his earlier accommodations were little more than stable rooms, Da Vinci's final home was a luxurious house near the royal palace in France. He lived at Clos Lucé, a château located in the Loire River valley. And the free room and board wasn't all—Leonardo was well paid for his work during these final years and was reputed to have been closer to Francis than any of his previous patrons. Apparently the king did not ask Leonardo to produce much toward the end of his life. His primary role was to serve as the king's friend. There may have even been an underground passage between the château and royal castle, which would have given the king easy access to his aging friend.

Toward the end of his life, Leonardo spent much time sketching. He developed some of the first sketches of water flowing freely and circulating

in a whirlpool. Later, scientists researching turbulence would actually study his drawings. Leonardo also developed preliminary designs for scuba gear, diving suits, movable bridges, underwater craft, and many other devices that foretold designs to come.

Francis, by all accounts, had a special place in his heart for Leonardo and the feeling appears to have been mutual. Leonardo's favorite work was the *Mona Lisa*, which he kept with him at all times, until, as evidence suggests, he either gave or sold his treasure to King Francis.

King Francis remained a patron of the arts after Leonardo's death; he collected masterpieces from other artists, including Michelangelo, Cellini, Raphael, and Titian. His royal palace, decorated with works from Leonardo and others, was a true tribute to Renaissance art. What an amazing museum it would have made.

Da Vinci University

Wish you could have signed up for painting classes with the great Leonardo? Even if you were alive during the Renaissance, you would have had a tough time. Leonardo never established a formal school or workshop. However, he did instruct plenty of students and apprentices over the years. During Leonardo's years in Milan at the court of Sforza, he probably had a number of apprentices and pupils. He even wrote training guides specifically for these students, and these documents were later collected in book form as *A Treatise on Painting*.

Leonardo was a hands-on teacher and also collaborated on a number of works with his students during this period, some of which still have questionable attributions. Several of his students' works have even been incorrectly attributed to Leonardo himself. This collaborative style makes it hard to place blame for mistakes, and also makes it hard to give credit where credit is due.

Da Vinci's pupils during this Milan period included Giovanni Antonio Boltraffio (his earliest pupil), Bernardino de' Conti, Gian Giacomo Caprotti (nicknamed Salai), Giovanni Agostino da Lodi, Andrea Solario, Giovanni Ambrogio de Predis (also known just as Ambrogio de Predis), Francesco Napoletano, and Marco d'Oggiono. While Leonardo was in Milan in the early 1500s, Bernardino de' Conti and Salai continued as his apprentices. He also had a new crop of assistants, including Bernardino Luini, Cesare da Sesto, Giampietrino, and Francesco Melzi. (Melzi later became his personal companion, artistic heir, and likely lover.) Some of these pupils eventually succeeded in their own right, painting famous works such as *La Belle Ferronniere* and the *Madonna Litta*.

Leonardo reportedly chose some of his assistants for their good looks rather than their artistic abilities (Francesco Melzi and Salai in particular). Melzi, unlike Salai, did produce a few paintings during his many years with

Leonardo, so we know that the relationship was at least slightly more than personal!

The commission to paint *The Virgin of the Rocks*, one of the master's early major works, was actually given to both Leonardo and his assistant, Ambrogio de Predis (c. 1455–c. 1508), in 1483. Ambrogio served as a court painter to Ludovico Sforza and hosted Leonardo in his home when Leonardo first came to Milan. The two collaborated on paintings throughout the 1490s, and *The Virgin of the Rocks* is the best known of these collaborations. In this work, Leonardo painted the central picture, while Ambrogio de Predis painted two side panels showing angels playing musical instruments. Two versions were eventually completed, thanks to the resulting lawsuit (see [number 36](#) for the complete story on this work). Although in the later version the angel kneeling behind the infant Jesus is undoubtedly Leonardo's work, he most likely did not finish it. The Madonna and landscape aren't as good technically, suggesting that a student probably painted them.

One of Leonardo's students from Milan, Andrea Solario (1460–1524), made his own style by mixing elements of Leonardo's work with the contemporary Lombard and Venetian schools of painting. His bright colors, fantastical landscapes, and harmonious groupings of figures emulate Leonardo, while some of his naturalistic details echo the Lombard and Flemish traditions. Leonardo probably used another one of his Milan students, Boltraffio, as a test bed for his teaching, and it seems to have paid off. Boltraffio's training is visible in many of his works, including his 1495 painting *The Virgin and Child*, which he may have based on Leonardo's sketches.

Later in Leonardo's life, during his final years in Rome (around 1509–1516), he continued to have many students. In fact, Leonardo's students copied his final painting, *St. John the Baptist*, many times. Since many of Leonardo's original works are now lost, in many cases only copies done by his pupils allow us to see the true scope of his work. Though Leonardo's students spent much time copying the master's works, few of them ever transcended his direct influence to become well known in their own right. Only two of Leonardo's followers, Bernardino Luini and Il Sodoma, seem to have developed well-respected careers independent of Leonardo.

Bernardino Luini, a Milanese painter, was born sometime between 1470 and 1480 and lived until 1530. It's assumed that he was Leonardo's student, though there's no actual evidence to support that claim. A number of Luini's

works, including *Christ Crowned with Thorns* and some of his paintings of the Virgin and Child (such as those at Saronno), show a style similar to Leonardo's in terms of color choices, overall design, and the sense of depth given by the paintings' relief elements. In these aspects, Luini came closer to replicating Leonardo's style than any other contemporary artist.

But Luini's style was, in many ways, distinctly his own. For one thing, his works have a sweetness that Leonardo's more ambiguous paintings lack. Also, Luini's works are generally more religious than Leonardo's. Many of Luini's frescoes are well known, and while Luini certainly was not a master of many fields as was Leonardo, his works do an admirable job of instilling a sense of religious stillness in observers.

Giovanni Antonio Bazzi (1477–1549) is another artist whom Leonardo influenced significantly, although once again, there is no evidence that he studied directly in Leonardo's studio. Known by his nickname, Il Sodoma, Bazzi came to Milan in the late 1400s as a glass painter's apprentice. Il Sodoma was a natural at drawing, but he learned several things from Leonardo, including color selection. His works are often charming and poetic, and the faces of the women and children he created are quite beautiful. However, none of his works have the timeless mystery and appeal of Leonardo's, showing that once again genius is a hard act to follow!

PART 2

The Best of the Best of the Best

THOUGH LEONARDO'S INTERESTS were all over the map, today we primarily know him for his paintings, and for good reason. They demonstrate Leonardo's various technical innovations, including the blending techniques of sfumato and chiaroscuro. Leonardo pioneered the use of realistic perspectives in his paintings, and he brought his scenes to life with fantastical backgrounds. The *Mona Lisa* is probably his most famous painting today, but some of his lesser-known works were also immensely popular during his lifetime.

So what could he do besides paint, you ask? Plenty—Leonardo was a talented innovator in many other artistic fields. He produced designs for sculptures, including what would have been the largest bronze sculpture ever cast if it had been built. With his background in both art and mathematics, Leonardo was a natural for architecture—he designed a number of churches, palaces, fortresses, and military structures. He also devoted time to a personal project called “Ideal City,” a master plan for city planning meant to provide a hygienic urban design to protect city dwellers from the plagues that decimated populations during Leonardo's lifetime. While none of Leonardo's architectural designs were ever built, other contemporary architects did adopt some of his concepts.

Whether painting his most famous works, like the *Mona Lisa* and *The Last Supper*, or planning new and innovative city

structures, Leonardo's expertise and breadth of knowledge reached far beyond traditional areas of art and architecture.

Early Sculpture: A Celebration in Three Dimensions

During his apprenticeship to Andrea del Verrocchio (1468–1472), Leonardo learned how to paint—but his education didn’t stop there. He was exposed to different aspects of art and craftsmanship, including how to make panels and canvases, castings, and sculptures. Leonardo was a bit biased in that he considered painting to be the true sign of genius in an artist. Leonardo viewed sculpture as being more mechanical, whereas he saw painting as more expressive and creative. Lucky for us he excelled at both.

Leonardo’s early experiments with sculpture focused on the human emotions. During this period, he created several busts of women demonstrating various expressions, including smiles and laughter. His interest in mathematics probably enhanced his ability to create geometrically precise sculptures and busts.

Many Renaissance sculptors took inspiration from the classics. Michelangelo and Raphael, for example, studied classical proportions, styles, and technique. You can see classical motifs in much of their work. Leonardo, on the other hand, was more of an individualist. You can see his personal style in all of his work, particularly in his approach to three-dimensional art.

Sculpture, for Leonardo, wasn’t just about the final result. He also used sculptures to enhance his paintings. Leonardo made clay studies of things like draperies, which he then used as models for his paintings. He most likely used this technique primarily in his early works, such as the draperies on the angel he painted as part of Verrocchio’s *The Baptism of Christ*.

The Lady with the Primroses is supposedly one of Leonardo’s first marble sculptures. But did Leonardo really create it? Historians know that this sculpture was made sometime between 1470 and 1480, placing it squarely within the years that Leonardo worked with Verrocchio.

Stylistically, it resembles Leonardo's work more than his master's; while this sculpture was originally credited to Verrocchio, experts now think Leonardo was its primary sculptor.

This particular bust was probably created from a live model, Ginevra de' Benci, also a model for one of Leonardo's early paintings in 1474. De' Benci, who came from an educated family of bankers, was one of the most famous female intellectuals and poets of her day. This work is particularly significant because, unlike classical busts that typically only show the figure's head and shoulders, this one displays the figure's hands and arms as well. Just as Renaissance portrait paintings were starting to show people in three-quarter (rather than frontal) view, sculptures were also beginning to show more and more of the whole person. This transition relates back to the Renaissance focus on humanism. As society began to place more emphasis on the individual and his or her personal dignity, artists such as Leonardo embraced this new social movement by allowing more individual expression in artwork.

Form, Function, and the Whole Nine Yards

It's difficult to know which works are actually Leonardo's because he belonged to Verrocchio's workshop for years, and then had his own students afterwards. One of the few pieces about which there is no doubt, though, is a bronze statue called *Horse and Rider*. It dates with relative certainty to Leonardo's late years, 1516–1519. During this period, he made several models of horses for the King of France, Francis I.

This particular statue, featuring a horse rearing up on its hind legs, looks a lot like other horse-and-rider sculptures Leonardo made earlier in his career. The biggest of them all was the colossal *Statue of Francesco Sforza* (see [number 29](#)), a full-sized monument designed in the 1480s, which was never completed in its planned form.

Leonardo was also involved with a horse-and-rider sculpture created for the funeral monument of Gian Giacomo Trivulzio. From the sketches, we can tell that this sculpture would have been quite a spectacle, having a marble base and eight other figures. The horse would have followed the same basic design as the aforementioned Sforza monument, only with a more dynamic posture. There is no evidence, however, that the work was ever completed.

If, at this point, it's beginning to seem as if Leonardo rarely completed any of the sculptures he concocted, this isn't the case. It's nearly certain that Leonardo sculpted other pieces that were indeed finished, such as *The Young Christ*. Leonardo worked on this terra-cotta statue between 1470 and 1480, roughly the same period during which historians believe he created *The Lady with the Primroses*.

In addition to these accomplishments, Leonardo worked on sculptures executed mainly by others in his workshop, such as *St. John the Baptist Teaching*, a bronze completed in 1511. Giovanni Francesco Rustici, a student originally in the Medici Garden, sculpted this statue in large part. Leonardo and Rustici met in Verrocchio's workshop, and Rustici worked alongside

Leonardo for many years afterward. Rustici could have been famous by way of patronage to popes and kings, but unlike Leonardo, he didn't seem to have much ambition and preferred to be alone. Fortunately, since he came from a wealthy family, he had the luxury of doing as he wished.

In the early 1500s, Rustici was working with a local merchants' guild commissioned to create bronze statues for the church of San Giovanni. The star attraction was to be a sculpture of St. John the Baptist. As the story goes, Rustici refused to work with anyone except Leonardo, and the two artists probably designed and executed the statues together. Leonardo's contributions to the sculpture are evident in several areas, especially in the hand and finger positions of St. John. Similar positioning can be seen in other Da Vinci works, such as his painting *St. John the Baptist*, created between 1513 and 1516. The finger pointing is nearly identical to that seen in the San Giovanni sculpture. It is also quite similar, in this respect, to another one of Leonardo's probable paintings, *St. John in the Wilderness*, which dates from 1510 to 1515.

A Horse Is a Horse, of Course, of Course

Whether it's yard gnomes, porcelain Santas, or pink flamingos, most of us appreciate some form of small outdoor sculpture. In 1483, Leonardo set about creating the largest statue the world had ever seen. His personal mammoth was a design for an oversized equestrian *Statue of Francesco Sforza*, mentioned in the previous point. This grand project was begun in honor of Francesco Sforza, the father of Ludovico Sforza, Duke of Milan. At more than twenty-four feet high, the statue would have been enormous.

Sculpture was never Leonardo's favorite art. But this particular project probably interested Leonardo because of his fascination with nature and animals, especially horses. While this design was a Leonardo original, the notion of capturing a battle scene in sculpture definitely had precedents in Roman and medieval artwork, and Leonardo probably took cues from the Roman statue of Marcus Aurelius.

While Leonardo had created many sketches and variations of the design by the early 1490s, he still hadn't built an actual statue. At this point his patrons were getting impatient, so Leonardo had to hurry and create a full-scale clay model. It was quite a hit and was set up in the garden of the Palazzo Vecchio. People traveled from all over to see this enormous masterpiece, affectionately dubbed *Il Colosso*. The clay model did wonders for Leonardo's reputation. People all over Italy knew him as that crazy artist who'd made the fantastic tribute to the Sforza family. The final bronze statue should have been one of Leonardo da Vinci's crowning achievements. He even had to design special furnaces for the bronze casting, since none of the existing furnaces was even close to being large enough.

Despite the design's immense popularity, it is not certain that this statue ever really could have been built, as there was no precedent at the time for casting a hollow-shell statue (close to two inches thick) on such a large scale. Leonardo and his workshop were in the middle of obtaining bronze

(no small task for a statue that would have weighed more than sixty tons) when warfare demands intervened. France was invading Milan, and the bronze Leonardo would have used for the statue was cast into military equipment, such as cannons.

Adding insult to injury, Leonardo's treasured clay model didn't even survive the war. As the French encroached on Milan in 1499, French soldiers set up outposts near the Palazzo Vecchio. The clay horse statue was destroyed when the French used it for target practice! The bits that remained degraded slowly over time, and nothing of the original is left today.

Draw Up a Chair

Renaissance art paid homage to its Greek and Roman ancestors, but at the same time forged its own path. It wasn't enough to copy the classics; Renaissance artists went one better! Different methods of artistic representation were developed during the fifteenth and sixteenth centuries, and Leonardo popularized several of them, establishing gold medal standards that future artists would emulate.

One of the most enduring innovations in Renaissance drawing was the notion of linear perspective. The concept of perspective involves the idea that it's possible to represent a three-dimensional shape (such as an apple or building) on a two-dimensional piece of paper or canvas. Sounds simple, but that's because we take it for granted today. Leon Battista Alberti (1404–1472) devised a mathematical model for drawing in perspective, where the artist pretended to draw as if through a window. This method made use of a “horizon line,” which represented eye level, and used “vanishing points” that served as connection points for all lines of sight. These points helped to designate locations for all objects in the scene. Artists drew “visual rays” from vanishing points, and through these rays they could create objects composed of right angles (such as walls, bricks, or anything else with a sharp edge).

One-point perspective (which, as the name suggests, contains one vanishing point) was useful for scenes that looked down a narrow corridor or alley. Leonardo's *The Last Supper* is an excellent example of an interior scene that used this type of linear perspective. Two-point perspective was incorporated more often for landscapes and other scenes that contained wide angles of view. Early Renaissance architects such as Brunelleschi and Alberti worked with linear-perspective techniques, and Leonardo was a major proponent of this new drawing method.

In learning how to construct precise, accurate perspective drawings, Leonardo may have worked with a device called a perspectograph. The idea behind it was similar to a mechanic's workbench, only it was for drawing. This system involved a table with a stand that had a cutout through which the artist could trace perspective lines of objects beyond the stand. While Leonardo didn't invent the idea of drawing in perspective, he used it to such an extent that other artists soon came to admire, and then imitate, his style.

Leonardo was actually increasing his workload by painting more realistically (and more three-dimensionally) than his predecessors. With this new way of drawing, he had to develop new techniques to make the entire painting appear more convincing. No longer would simple, flat colors suffice! Figures seen in the round had to be properly distinguished, both as their own forms and as objects distinct from the scene's background. Thus, historians largely credit Leonardo with developing another critical artistic innovation, known as *chiaroscuro*, which, translated from Italian, means "clear/light and dark." Leonardo used light and dark colors to portray both shade and shadow more convincingly, as they were actually experienced in real life. This use of the chiaroscuro technique represented the first time a Renaissance painter had contrasted lights and darks to help create a truly three-dimensional image. Chiaroscuro is evident in many of Leonardo's paintings, including the early *Benois Madonna* of 1478. Leonardo's chiaroscuro technique has become so integral to artistic training that some historians have even called it one of Leonardo's most important artistic contributions.

In addition to representing lights and shadows accurately, realistic paintings need to convey subtle transitions from one tone to another. *Sfumato*, an Italian word meaning "vanished," is used to describe a technique Leonardo developed to do exactly that: graduate color values between parts of an object to make it accurately reflect the object's full roundness. Early Flemish painters had experimented with these methods, but none had used the technique to the same extent or with as much success as Leonardo.

The *Mona Lisa* is an excellent example of sfumato. While the woman's face is fully enveloped by shade and shadow, it is also completely smooth. Leonardo used brushes, as well as his fingers, to blend the tones and create perfect transitions to represent light as it swept around the woman's head. Then, the light in the scene simply subsides into darkness. The transitions

between light and dark here are imperceptible; the superb blending allows viewers to focus on the painted subject, rather than the technique of painting.

The Scene Behind the Scene

In the classical period of ancient Greece and Rome, art focused on celebrating the gods. The Renaissance brought out a new tradition of naturalistic art, one that placed religious scenes or even portraits in natural surroundings. Subtly woven into many of these works was the idea that it was possible to represent the presence of a supreme being while simultaneously paying attention to the individual. Many of Leonardo's paintings were religious in nature, and the Renaissance's focus on humanism gave Leonardo the opportunity to incorporate his fondness for the natural world into the preexisting influence of Christianity.

Leonardo took this developing Renaissance methodology to a new level. Many of his works include fantastic landscapes as backgrounds, and these backgrounds sometimes involve complex architectural creations (think Escher) or landscapes with natural elements such as rolling hills, valleys, streams, and mountains. Yet even these more natural elements take on an air of the ethereal thanks to Leonardo's innovative techniques.

So how did Leonardo achieve these effects? His conceptual method involved rendering scenes as if they appeared through a fine veil of mist. An early precursor of this technique, called *sfumato* (see [number 30](#)), is actually visible in his earliest remaining landscape drawing, created in 1473 when Leonardo was only twenty-one. Details of this landscape seem to recede into the distance thanks to atmospheric perspective.

Perhaps the most famous of Leonardo's background landscapes is in the *Mona Lisa*. Rather than placing her indoors, as was typical for most portraits, Leonardo positioned Lisa, the woman with the enigmatic smile, in front of a dreamlike landscape full of craggy mountains and sinuous streams. The background's movement captures Leonardo's view of the natural world, one that is ever changing and constantly in motion. The only man-made element in this background is a small bridge crossing one of the rivers. If you

were to inspect the background closely, you'd also see that the two sides do not match up—the horizon on the right side of the figure is significantly higher than that on the left side. Most likely, this was a deliberate trick on Leonardo's part to lend an increased sense of activity and realism to the central figure by making her place in the painting appear to change depending on whether you look at her from the left side or from the right.

A late painting, *St. John in the Wilderness* (attributed to Leonardo, although not confirmed as his), goes one better. It combines a realistic natural setting (trees, roots, cliffs, and animals) with one of Leonardo's traditional misty backgrounds. Toward the top left of the painting, the landscape recedes into mists and lakes—very surreal. An earlier painting, *The Virgin of the Rocks*, creates a fantastic setting for a typical religious theme, placing the subjects in a cave, or grotto. The scene is complete with a reflective pool of water, gorgeous plants, and a background of rocks that erupt from the floor and hang dangerously from the ceiling. Rather than receding into darkness, the rocks extend into a bright misty region typical of Leonardo's other backgrounds.

Finish That Painting! Leonardo and the Fine Art of Completion

While no one would ever question Leonardo's overall genius, doesn't it seem strange that we celebrate him so much as an artist while so few of his paintings remain today? As mentioned previously, one reason for this conspicuous lack was Leonardo's tendency to start many projects, but actually finish very few. Even in his earliest days, he flitted from subject to subject, learning and experimenting with writing, drawing, painting, sculpting, music, science, engineering, and math. So why didn't he just focus on one art form? It's possible that as stunning as his works were, they did not match the perfection of the images in his head, and he gave up rather than fail in the expression of his imagined perfection. Another possibility is that, especially later in life, Leonardo saw himself more as an inventor and scientist than as an artist and thus devoted more time to such works. The inevitable consequence was that he ended up neglecting his art.

Leonardo was an innovator, and as such he wanted to rush out and test newly discovered techniques—which, of course, went against the tried-and-true methods of his time. Granted, his innovative approach sometimes had disastrous results. Take, for instance, his fresco *The Last Supper*. Leonardo painted this masterpiece using a new technique he'd developed, but the paint began to peel from the wall almost immediately. Another ambitious later work, *The Battle of Anghiari*, was supposed to have presented an entire battle scene on a wall opposite a new work by Michelangelo. When Leonardo actually painted the work, again using a new experimental technique, the paint adhered to the walls without a problem this time. Unfortunately, when Leonardo applied heat to dry and fix the paint, his luck ran out. Some of the paint ran off the walls and the rest scaled off in pieces. The project was almost a complete failure, and other artists actually wound up painting over what remained of Leonardo's original work.

Beyond his penchant for experimentation (which sometimes backfired), perhaps Leonardo simply got bored. Maybe he worked first and most intensely on the aspects of a painting that he found most interesting: the design and rendering of faces, hands, hair, and background landscapes. Once he was finished with those portions, he may have simply left other parts of his paintings incomplete or had his students fill in certain elements, which seems to be the case with his *Portrait of a Musician*. Leonardo rendered the face and hands exquisitely, but he barely sketched the drapery of the young man's tunic into place.

Not finishing what he started got Leonardo into trouble on more than one occasion. In some cases, patrons never paid him for his unfinished work; in other cases, he had to return the initial advance money he received when he didn't complete a painting on time. For example, despite having a contract, Leonardo never completed *Adoration of the Magi*, meant for the monks at Scopeto in 1481. Apparently, Leonardo only finished a sketch and never even started the main painting. A lawsuit over another work, *The Virgin of the Rocks*, dragged on for about ten years. As a result, Leonardo eventually completed two versions of the painting to fulfill the contract.

The equestrian *Statue of Francesco Sforza* is yet another work that, although ambitious in creative scope, perhaps overreached the realm of feasibility (see [number 29](#)). If Leonardo had been willing to settle for a smaller sculpture—life-sized for instance—the statue might have been built and probably would have survived the battles in Renaissance Italy. However, settling doesn't seem to have been in Leonardo's nature. He designed this sculpture to stand more than twenty-five feet tall, and as a result, he ran into problems. For starters, there was no foundry big enough to create such a large sculpture. Then, as he was gathering bronze to cast the sculpture, Milan became embroiled in war and Leonardo had to surrender his precious supplies for military usage. Leonardo had only a clay model of the horse statue to show for all of his efforts, and that was eventually destroyed when the French used it for target practice.

Although Leonardo's failure to complete so many of his works might lead you to believe otherwise, at times he was quite a perfectionist, refusing to let go of certain works to which he felt particularly attached. The *Mona Lisa* is a perfect example of this; Leonardo moved his favorite painting around with him from studio to studio, working and reworking it for many years until near the end of his life. In fact, he never really judged this painting finished.

Building the Scene-Scape

The advent of humanism brought plenty of changes to Renaissance artists and patrons. Artists like Leonardo had to develop new techniques and skills to paint increasingly convincing scenes—people expected more, and artists had to live up to those expectations. Fortunately, Leonardo excelled at incorporating nature and landscapes into his paintings. He spent much time studying anatomy, biology, and geology, and his observations gave him a keen sense of proportion and movement.

Along with this interest in humanism, architectural landscapes also became increasingly popular during the Renaissance. As this idea was a relatively new addition to Leonardo's artistic bag of tricks, some of his early examples seem awkward or forced. The *Dreyfus Madonna* of 1469 demonstrates this problem quite well. The Madonna is seated in front of a window, which is too close to the viewer to be properly discernable. Its rendering is too dark in contrast to the brightness of the Madonna in the foreground, and it appears out of place. The landscape seen through the window seems equally disjointed. Despite questions about its execution, this painting is important because it represents one of Leonardo's early attempts to create coherence amongst natural, built, and human forms.

From 1472 to 1475, Leonardo contributed to at least one version of an Annunciation scene. This painting features many architectural elements, including a marble sarcophagus representing a Medici family tomb. The composition appears awkward, and not all of the figures are drawn in the same perspective (the Virgin Mary is posed in a three-quarter view, whereas an angel is depicted almost sideways). Nevertheless, this painting has much more pronounced architectural definition than Leonardo's previous works. There is a partially revealed doorway, and the wall behind it is defined with enormous quoins. This sort of precise architectural detailing was without classical precedent, and even artist-architects such as Brunelleschi and

Alberti did not present built elements to such an extent. The landscape in the background appears nearly flat, however, indicating that Leonardo still had some refining to do when it came to working out the coordination of nature and architecture fully.

Madonna of the Carnation is another interior scene that deals with the background in a more three-dimensional way. This painting dates to 1478, and you can easily see Leonardo's increasing expertise with perspective. The arched colonnade clearly shows one-point perspective, though the angle of view is somewhat inconsistent with the perspective of the foreground figures.

The Last Supper, completed in 1498, combines the best of both worlds: humanlike figures with real architectural interiors. Leonardo used single-point perspective to create a space that was geometrically precise. Most of the painting is also symmetrical, showing off the latent influence of classical notions of balance and proportion. The upper part of the image (before restoration) actually shows imperfect symmetry and slightly off-center perspective. Leonardo found a way to sneak in his own special touch through these small sorts of details.

An Architecture of the Imagination

As if creating some of the first Renaissance architectural paintings wasn't enough, Leonardo also painted scenes that demonstrated a sort of "faux architecture." This term might sound odd, but bear with us. These works contained architectural elements that had more in common with flights of fancy than with anything rooted in concrete reality. The *Adoration of the Magi* of 1481 is one of the best examples. Commissioned for the monastery at San Donato a Scopeto, Leonardo worked on this scene during his years under Lorenzo de' Medici, and it was the first work that he created largely on his own. While the painting focuses on Mary, the baby Jesus, and the three Magi, the scene also contains about sixty other people, a variety of animals, and other natural elements.

Although Leonardo never finished this painting, it is clear that the scene contains architectural elements that were, at least partially, more imaginary than real. Take, for example, the staircase depicted in the background. It could be part of a medieval castle, or maybe it belongs to the ruins of a Roman imperial palace. Either way, these structures would have been completely out of place for this religious scene set in a lush countryside—not the best place to build a castle, which surely would have required at least basic defenses.

The scene is a fanciful composition, to be sure. Its early sketches were even wilder, showing animals in different perspectives and poses. Some sketches had parts of the stairs dating from a different period and age; some were even composed of different materials. It was a motley crew of a painting, and Leonardo probably loved painting every minute of it. There are multiple points of perspective, and the scene almost looks more like a collage than one coherent painting.

Perhaps Leonardo's playful side came to the fore through these sorts of details, or maybe they afforded Leonardo the opportunity to contrast his new

skills against a more whimsical background. Whatever the reason, the fanciful architecture incorporated within Leonardo's paintings increases the depth of his work and speaks to both his inherent creativity and his willingness to take risks.

It's All in the Details

Leonardo had a knack for capturing facial expressions, and you can see that even in his early works. *Lady with an Ermine*, painted around 1490 (or perhaps earlier), is a portrait of Cecilia Gallerani, the young mistress of Duke Ludovico Sforza. Often called the first modern portrait, this work is much different than established methods of portrait painting in the fifteenth century. Leonardo posed Cecilia in three-quarter view, rather than in the strict profile view favored at the time. There's also an added sense of motion inherent in this scene, as she twists her head and upper body, fixing her gaze on something outside the field of view. The warm lighting provides a three-dimensional look that has an almost sculptural effect. The painting also renders the detailed embroidery and ribbons on Cecilia's gown with painstaking precision. The beauty of Cecilia's face, and her enigmatic half smile, evoke a later (and more famous) portrait—the *Mona Lisa*.

Another one of Da Vinci's famous faces is found in his *Ginevra de' Benci* portrait, which could date to as early as 1474, when Leonardo was still working with Verrocchio. It includes some elements typical of Leonardo's style, such as a mystical backdrop and detailed background rendering, and it also shows botanical elements, such as the juniper bush. The portrait itself is much flatter and has none of the three-dimensionality of *Lady with an Ermine* or some of Leonardo's other later works. However, her face and skin do have that marble appearance found in Leonardo's later works, and the emphasis on the ringlets of her hair is also typical Leonardo.

Another early work, *Portrait of a Musician*, dates from around the same period (1482–1483). However, attributing this painting to Leonardo is problematic—there are no records mentioning the painting, nor is there any documentation for its commission. The painting has some elements of Leonardo's style, but one of his students could also have been the artist—the

likeliest suspects include Bernardino Luini, Giovanni Boltraffio, and Ambrogio de Predis.

So what's the proof of Leonardo's influence here? For starters, you can look at the shadowed background, the length of the figure, and the three-quarter view of the subject. But that's not all. The delicate bone structure required detailed knowledge of anatomy, and Leonardo was one of only a handful of painters who had that skill. Then there's the subject's casual, unforced pose, delicate fingers, and curling hair. All of these details point to Leonardo. This painting also remained unfinished, and various elements are only sketched in—and who was our favorite artist known for leaving works half done? None other than Leonardo!

Monks and Lawyers and Artists, Oh My!

Who would've thought that Leonardo had a legal run-in with Catholic monks? That's exactly what happened with *The Virgin of the Rocks*. In fact, this project was actually done twice because of the lawsuit that ensued!

The chapel of the Immacolata at the church of San Francesco Grande, in Milan, originally commissioned *The Virgin of the Rocks* in 1483 as an altarpiece. One of Leonardo's first commissions in Milan, the painting relates to the Immaculate Conception, the Catholic Church's teaching that Mary was conceived without original sin. The Italian papacy charged Leonardo with the task of portraying the Virgin in a pure, holy, and innocent manner.

The original contract was very specific, spelling out the exact subject of the picture. The premise seems straightforward enough: the monks of San Francesco wanted the Virgin to be the painting's central focus, with prototypical Greek angels flanking her. Leonardo designed his work to fit into a panel, which would have been framed by painted or gilded shutters. Evangelista and Ambrogio de Predis were to complete the surrounding work. Details of the background (mountains and rocks) were also laid out before Leonardo began work on the project. The original contract even called for specifics on the Virgin and angels' robe colors! Despite all of the specifics, Leonardo did take some artistic license. For instance, he exchanged one of the angels for St. John.

This wasn't exactly a rush job, but the contract length was short—only eight months to complete the entire painting. It was supposed to be completed prior to the Feast of the Immaculate Conception, held annually on December 8. Predictably, Leonardo ran into some trouble finishing the painting on schedule, and the work became the subject of a lengthy lawsuit. The eventual result was that two versions of the work were created—one is presently part

of the Louvre's collection, while the other resides in London's National Gallery.

In addition to the missed deadline, Leonardo and de Predis apparently had a dispute with the monks about their commission. Leonardo complained to the monks that they hadn't received their full payment, and the initial amount negotiated for the entire work had barely covered the cost of the frame! Disputes and lawsuits over time and money continued for many years.

Eventually the monks deemed the first version incomplete, thus forfeiting the rest of the money and giving Leonardo ownership of the painting. Leonardo probably gave this version as a gift to King Louis XII of France, who helped resolve the lawsuit, and this is the version that now hangs in the Louvre. Leonardo renegotiated the contract with the monks, who agreed to pay for a second version in 1506. The monks gave Leonardo and de Predis two years to complete this painting, paying them half the amount originally negotiated. This version was actually finished on time and was finally hung in the chapel on August 18, 1508. It remained there until 1781, when it passed through the hands of a number of collectors, eventually ending up in the National Gallery in London.

While Leonardo is likely the sole artist behind the Louvre version, this may not be the case with the second. The newer painting contains a few significant changes from the older version. The colors are brighter and bluer, the angel on the right is no longer pointing at St. John (who is now holding a cross), and halos have been added above the Virgin Mary and one of the angels. Leonardo probably supervised the creation of this second painting, but it is likely that other artists in his studio did the actual painting.

The Life and Times of *The Last Supper*

One of Leonardo's signature paintings, *The Last Supper* is also one of the most accident-prone and least preserved. Leonardo completed this giant wall painting in 1498. It depicts the moment at which Jesus announces that one of his disciples is going to betray him (ultimately, it is Judas).

Duke Ludovico Sforza, Leonardo's patron at the time, commissioned the painting. Sforza had selected the church of Santa Maria delle Grazie as his family chapel, and Leonardo was hired to paint a large mural of the Last Supper on one wall of the refectory (a room where meals are served). Although the work was to be done on a grand scale—thirty feet long and fourteen feet high—Leonardo was not one to turn down a challenge.

Leonardo completed *The Last Supper*, certainly one of his great masterpieces, in only three years. This time scale seems especially miraculous when compared to many of Leonardo's other projects, which either were never completed or dragged on for many years.

The work's design is one of Leonardo's most innovative. The perspective makes the painting appear to be a logical extension of the room, with the eye invariably drawn to the head of Christ at the center. The apostles are crowded around the table in natural poses, in contrast to the stiff appearance of most versions of this scene during Leonardo's time.

Each apostle has a distinctive appearance and character. Apparently, Leonardo modeled each of their faces on a particular individual. The two main figures, Judas and Christ, gave Leonardo the greatest difficulty. Christ's expression, a model of serenity, is a dramatic contrast to the apostles' stunned and conflicted faces.

One legend tells of Leonardo's difficulty with modeling Judas, Jesus' betrayer. Supposedly, the chapel's prior complained about how long the painting was taking, and Leonardo retorted it was because he was lacking a

model for Judas, but the prior seemed to him a good candidate! Leonardo got away with this slight, but luckily doesn't seem to have made a habit of it.

Leonardo worked on *The Last Supper* in his characteristic style. Days of frantic work, during which Leonardo worked all day without stopping, were followed by days during which Leonardo was not seen at all. After being absent for several days, he would sometimes appear, gaze silently at the painting for several hours, excitedly add a few brush strokes, and then disappear again. Leonardo did eventually finish the work, however, and the public immediately recognized it as a masterpiece.

So all was well—Leonardo finished this sacred artwork and everyone was happy. Right? Unfortunately, *The Last Supper* began to deteriorate almost as soon as it was finished, once again due to Leonardo's love of innovations. Instead of using the usual method of fresco painting, in which paint was applied to a wall of fresh, wet plaster, Leonardo designed a new method where he applied paint directly to dry plaster. This method let him work much more slowly and methodically and allowed a wider range of colors and tones in the paint. Unfortunately, that's where the good news stopped. This method proved unstable, and the paint began flaking off the wall during Leonardo's lifetime.

By 1586, the masterpiece had degraded to such an extent that it was hardly visible. Over the years, a number of attempts were made to restore the painting. Unfortunately, these methods often caused more harm than good, or they involved so much overpainting that little of Leonardo's masterpiece remained visible.

The work also suffered from more practical concerns in the church. At one point, workers cut a door opening through the bottom of the image—at the expense of Christ's feet, which were removed because of it. In 1796, Napoleon's troops even used the room containing the painting as a stable, of all things! After that, *The Last Supper* still had more than its share of disasters to endure. A flood in 1800 left it covered in a layer of green mold, and Allied bombing in 1943 blew the ceiling off the church rectory. Given this tumultuous history, it's surprising anything is left of *The Last Supper* at all!

An initial restoration was completed in 1954, and finally a twenty-two-year-long project was completed in 1999. The restoration attempted to remove centuries' worth of preservation and repainting, to reveal Leonardo's original intent. The process was truly painstaking, requiring restorers to

reattach tiny flakes of the original paint in their original locations. Unfortunately, parts of the work are beyond repair, including the facial expressions of the apostles. However, a number of copies exist, some dating from before the deterioration had become problematic. If you compare these views to the currently restored version, you can imagine how spectacular the original of *The Last Supper* must have been right after it was painted.

There's Something about Lisa

Just about everyone knows the *Mona Lisa*—it's the painting for which Leonardo da Vinci is, perhaps, most famous. Completed in 1506, this work of art went through a number of iterations before the design and execution were finally finished. What is it about this particular piece that has created such a lasting impact on the artistic world?

The subject of the *Mona Lisa* was most likely the wife of Francesco del Giocondo. A silk merchant in the late fifteenth century, Giocondo was also involved with the government in Florence, and he and his wife, Lisa, were probably married around 1495. The portrait poses Lisa as a pyramidal foreground to a distant, somewhat foggy landscape in the background. The glow on her chest radiates to include her face and hands, creating a softness not previously seen in Renaissance painting. This painting was much smaller than many of Leonardo's other works. It measures around thirty inches by twenty inches and consists of oil paint on a wooden panel.

With the *Mona Lisa*, Leonardo made profound use of the techniques he had developed throughout the Renaissance. The soft transitions between colors (*sfumato*) create a fully realistic three-dimensional figure with amazing modeling of the skin. Leonardo used the same techniques in the background—the sky and water complement each other perfectly. Similarly, the use of contrasting light for shade and shadow (*chiaroscuro*) creates a connection between the curves of Lisa's face and hair, and the mountains behind her.

While it appears that the figure of Lisa is floating in front of the landscape, in the original painting she is actually standing in between two columns, probably on a porch or balcony. Because these elements were removed from the final version, viewers today cannot experience the painting as it was initially intended.

The expression on this Florentine woman's face is one of the painting's most exceptional features. Her simple, dark clothing makes her face the real focus. Her smile appears to be at once both innocent and enticing. One account describes how Leonardo had to hire musicians and mimes to amuse Lisa during the sitting—after all, three years is a long time to pose! The entertainment could provide one explanation for Lisa's slight smile. Also significant about Lisa's expression is that one eye is slightly higher than the other, increasing the sense of movement in the painting. If you've ever seen the *Mona Lisa* in person, you know that her eyes seem to follow you around the room. Leonardo probably created this effect on purpose. The corners of the mouth and eyes are the most expressive parts of the human face, and Leonardo did not overdefine these parts of the *Mona Lisa*. Instead, they are highly shadowed and almost vague, causing her expression to appear to change depending on the viewer's perspective.

Like Leonardo himself, the *Mona Lisa* did plenty of traveling. Leonardo carried it with him to France during his tenure under King Francis I. At the end of his life he either gave or sold it to the king, and it eventually ended up in the Louvre. Napoleon borrowed the painting for a period, and it was hidden during the Franco-Prussian War to ensure it wasn't stolen or damaged. In 1911, a Louvre employee named Vincenzo Peruggia stole the painting and then tried to sell it, but he was captured and the artwork was returned to the Louvre in 1913.

The *Mona Lisa* was hidden again during World Wars I and II. Then, it toured various countries (including the United States) during the 1960s and 1970s. Unfortunately, due to security concerns, it's unlikely that it will leave the Louvre again any time soon. At present it resides in the museum behind bulletproof glass in a climate-controlled enclosure.

Oldies but Goodies

While his early work is probably his most famous, Leonardo made many paintings later in life that would become popular in their own right. One of Leonardo's last works, *The Virgin and Child with Saint Anne*, is one of his most celebrated. Leonardo first explored this somewhat obscure religious theme in a sketch done in 1498. The basic layout of the scene contained the Virgin Mary with her mother, Saint Anne, and the infant Christ. Although that early sketch has been lost, a later one, dubbed the "Burlington House Cartoon" (named after a former British owner's collection), shows a discarded concept for this work. In fact, this sketch is sometimes preferred over the finished painting!

During the Renaissance, a "cartoon" referred to a full-sized sketch that showed the planned layout of a painting, which the artist then transferred to the canvas or panel to be actually painted. The Burlington House Cartoon shows the infant Christ blessing a young St. John, accompanied by Mary and Anne. Leonardo abandoned this concept for unknown reasons and never actually painted it, but when the sketch was exhibited, it received major acclaim. This sketch is still celebrated as one of Leonardo's major works. The facial expressions and poses are considered much more natural than those in the completed painting.

The monks of the Florentine Santissima Annunziata commissioned the version of *The Virgin and Child with Saint Anne* that Leonardo actually did paint as an altarpiece for their high altar. Leonardo completed the work, which dates from 1507–1513, in his typical fashion: not on time. The monks, eager for their new work, had to commission another piece. In fact, they had given the original commission to Filippino Lippi, but he rejected the project, suggesting that the monks give the commission to Leonardo (whom he considered a superior artist). When Leonardo failed to complete the work on

time, Lippi took on the project, but he died before finishing his work. The monks finally got their painting when Perugino completed Lippi's work.

Leonardo's painting of *The Virgin and Child with Saint Anne*, completed well past the monks' deadline, shows Mary seated on her mother Anne's lap. Mary is leaning over to her infant son, who is holding a lamb. (The lamb represents a symbol of what Jesus would become: a sacrifice.) Anne's face is peaceful and serene, while Mary's suggests resignation, as if she realizes the fate for which her infant son is destined. She almost restrains Christ from embracing the lamb, and therefore his destiny, yet she also seems to have accepted his role.

The painting's composition is balanced and fluid, although some critics have remarked that the poses seem awkward. Leonardo positioned Mary's and Jesus' arms like links on a chain, links that span multiple generations. The background of the painting includes a typically Leonardoesque wilderness, complete with hazy, impassible mountain peaks and meandering rivers. The tree in the near background is more earthly than the misty background, but rendered with Leonardo's signature botanical precision.

Like so many of Leonardo's paintings, Leonardo left *The Virgin and Child with Saint Anne* unfinished. Careful examination of the painting has suggested that Leonardo himself painted the background and the three figures, while it's likely that one of Leonardo's students completed the rest of the painting, including the lamb and the drapery covering the Virgin's legs. Unlike many of Leonardo's paintings, which he worked and reworked, the paint on this one is of variable thickness, and the sketch lines beneath the paint are visible in places.

Leonardo painted his final work, *St. John the Baptist*, during his last years in Rome, between approximately 1509 and 1516. It's quite an unusual treatment of the subject. Scripture portrays St. John the Baptist as a gaunt creature living in the wilderness. The way Leonardo painted him, however, St. John looks almost womanly. He has Leonardo's signature long, flowing, curly locks, a demurely bent arm, and an enigmatic smile quite similar to Lisa's on the *Mona Lisa*.

Unlike most of Leonardo's paintings, there is no mystical background behind St. John. Rather, the painting shows a mysterious darkness from which a glowing figure emerges. A different artist likely painted the cross that St. John holds and the animal skin he wears, and it's possible that the same unknown artist darkened the background as well. *St. John the Baptist* was

widely copied by Leonardo's students, and a number of these copies exist with questionable attributions.

Building the Renaissance

Leonardo da Vinci was not a practicing architect, though he spent years studying mathematics, urban design, and civil engineering. He designed military structures, buildings, and other architectural objects. Even though none of his designs were constructed during his lifetime, he was amazingly prolific. Leonardo's voluminous drawings, sketches, writings, paintings, and other artwork reveal his architectural achievements.

Though not trained in architecture, Leonardo was familiar with architectural drawings. In addition to learning the language of architects, Leonardo used the perspective techniques he developed in painting to represent his designs for palaces, churches, cityscapes, and other projects. Particularly with landscapes, Leonardo was fond of drawing "bird's-eye perspectives." While typical eye-level perspectives were drawn as someone on the ground would see them, aerial views showed a project in its entirety, including the surrounding areas. Along with Michelangelo and Raphael, Leonardo was one of the first Renaissance architects to make use of this technique.

Filippo Brunelleschi (1377–1446) provided an early architectural model, one that Leonardo continued into the Renaissance. Brunelleschi was one of the first architects to seize upon classical foundations in the creation of a modern architecture that could rival that of its ancestors. He designed churches such as San Lorenzo and Santo Spirito, which were based on Roman ideals of balance, harmony, and proportion. Leonardo took those ideas under advisement in many of his own architectural designs.

Genius doesn't simply appear out of thin air; even masters such as Leonardo had to build their experience (and reputation!) on the success of others. Leonardo's main sources of architectural inspiration were probably Alberti, Bramante, and Raphael. Leon Batista Alberti (1406–1472), an architect, artist, composer, and author, was responsible for writing the

Renaissance's first treatise on architecture. He based his designs on classical architecture, and it is likely that Leonardo studied Alberti's designs during his apprenticeship to Verrocchio. Donato Bramante (1444–1514) was another primary Renaissance architect. As an official architect for Pope Julius II, he created masterpieces in the style of Greek and Roman classics, interpreting them in light of Renaissance Christian teachings. Raphael (1483–1520) followed in Bramante's footsteps by becoming the next papal architect. He was known for adhering to a fairly strict system of classical spatial organization. Raphael was also a distinguished artist. As you can see, there was clearly no lack of architectural talent during the Renaissance!

While synthesis of form and structure can be a goal for many architects, it is not a given. As both an artist and a student of mathematics, however, Leonardo had the distinct advantage of being able to conceptualize a project in its entirety. He was interested in appearance, as well as structure and construction. Leonardo's talent for encompassing both areas in his studies set him apart from many of his predecessors and paved the way for more modern ways of thinking about architectural design.

The Milan Dome

During his major period in Milan (1482–1499), Leonardo was busy with assignments from his patron, Ludovico Sforza, the Duke of Milan. His major artistic accomplishments during this time include *The Virgin of the Rocks* and *The Last Supper*, paintings that earned an esteemed place in history for their beauty, innovation, and highly skilled production. This was also a time of major experimentation for Leonardo—he produced paintings, sketches of military equipment, sculptures, machinery prototypes, and architectural designs.

One of Leonardo's most significant ventures in architecture occurred in 1488, when he created a preliminary design for the dome and tambour of the Gothic Milan Cathedral. This massive cathedral was a huge undertaking, not just for Milan but for much of Italy. Built over a five-hundred-year period, the cathedral brought the High Gothic style to Milan at quite a price. It is the central focus of town, with most streets ending at its doors. Work on the cathedral began in 1387. As political and religious power continued to change hands over the years, new designers and master masons were invited to work on the cathedral, which would be a living tribute to the creativity of Italian artists. Political and financial messes slowed down the project, though, and the great spire wasn't constructed until the mid-eighteenth century; additional spires and stair towers were built during the nineteenth century. By this point, some of the original work was already crumbling! Restoration was necessary, and that task occupied much of the early twentieth century.

During the end of the fifteenth century, the Sforza and Solari families exerted strong Tuscan influence over the cathedral's design (see number 21 for more on the Sforzas). The Solari family, based in Milan, included many artists and architects whose designs were prominent all over Italy. Giovanni Amadeo was slated to design the drum of the Milan cathedral, and despite

the burgeoning presence of Renaissance architecture, he was determined to keep a strong tie to the site's Gothic roots.

Around this time, Leonardo da Vinci was consulted regarding several aspects of the cathedral. As usual, he wanted to involve himself in as many projects as possible, so he submitted drawings for the dome. Even though it was never built, Leonardo's design for the dome was an important marker in his career since, at this point, he was starting to incorporate studies of mathematics (particularly geometry) into his designs.

This project also brings to light Leonardo's famed multitasking. For example, Leonardo produced designs for several types of construction equipment, and his ideas for cranes were particularly useful for this dome project.

Order in the Church!

The history of church design is a long and rich one. Religious structures are typically more permanent (and more respected) than any other type of building. Despite political and social turmoil, ecclesiastical architecture tends to survive. Ancient Athenians devoted their entire lives to constructing the Acropolis; the Parthenon, the Erechtheion, and other Greek temples were models of religious fervor coupled with civic pride. The Romans built arches and monuments for their emperors who, many Romans believed, had ties to the gods themselves. Medieval French architecture, as demonstrated by Chartres Cathedral and others, celebrated Catholicism with amazing feats of Gothic engineering. Across time, culture, and geography, churches and other religious edifices have provided opportunity for social consciousness and pride; they've also fascinated designers. Church designs were of particularly high importance because of their enduring influence. Is it any surprise that they interested Leonardo?

During the Renaissance, the principles of architecture were crystallized into treatises. Leonardo most likely read and studied these works, and the strict series of rules they presented probably influenced his rigorous church designs. Leon Battista Alberti's *On the Art of Building in Ten Books* (first published in 1485) is worthy of particular note here. This manifesto defined both symbols and usage, and was central to changing the perception of architecture from a craft into a true profession. Leonardo must have studied this work, because his sketches of religious architecture embody many of its principles.

Through his drawing, painting, and architecture, Leonardo was devoted to showing the order and articulation beyond what was visible. In the 1480s, Leonardo made pages and pages worth of sketches for various church designs. His notebooks include designs for multilevel structures and churches with domes, but he seems to have experimented most intensely with the

central-plan church. (Brunelleschi's churches made use of the central-plan design, and his designs probably influenced Leonardo.)

The basic idea for the central-plan design involved a focal point for the church—a square, circle, or some other variant—from which other rooms radiated outward. Leonardo made many sketches of the Greek cross, a three-dimensional cross shape where all legs were of equal size. His drawings are filled with complex geometrical interaction based on the idea of a modular unit that was repeated and combined with other identical units. Proportions, directly derived from formal mathematical relationships, were also key in his designs.

While Leonardo's various church designs were never actually constructed, they are significant because they provided inspiration for later Renaissance architects. Bramante in particular probably studied Da Vinci's church sketches; several of his churches show evidence of Leonardo's classical sense of proportion and form.

San Giovanni Church: Closer to Heaven

Renaissance Florence was historically a family-run town. Powerful families dominated each region, and the Florentine system of government was more or less an oligarchy. By 1343, the city was divided into sections, or quarters: Santa Croce, Santa Maria Novella, Santo Spirito, and San Giovanni. Each quarter had its say in nominating officials and would eventually have a major church supporting its saint. Leonardo became involved with the design of the church of San Giovanni.

This church has enormous cultural significance for Florentines. In addition to housing a number of sculptural masterpieces, it's rumored that several famous Italian artists and authors were baptized here, including Dante.

The Baptistery of San Giovanni, located in what is known today as the Piazza San Giovanni, was a crowning achievement. It was created and named for the patron saint of Florence, St. John the Baptist (San Giovanni in Italian). Workers began construction on this building in the eleventh and twelfth centuries, and hundreds of years later it was still going strong. The basic design is an octagonal structure faced with white and green marble. The most famous parts of the Baptistery are the bronze doors on the eastern side. These doors would eventually contain a number of sculptural scenes from the Bible. Their first designer, Andrea da Pontedera, worked on this project in the 1330s. This was the first time artists had attempted to cast sculptural bronze at this scale. At twenty-eight panels total, it was also a very large job!

A competition was held in the early fifteenth century for sculptural panels on a new set of doors for the Baptistery. Lorenzo Ghiberti beat out Brunelleschi for this honor, and saw his panels hung in 1424. Ghiberti received the honor of creating the remainder of the work, and this project kept his shop busy well into the 1450s.

Although he wasn't involved in the design, Leonardo probably played an advisory role during the creation of the sculptural doors. In the winter of 1507, he was called to Florence to aid a sculptor, Giovanni Francesco Rustici (1474–1554), with a project for the Baptistery. The three bronze statues of St. John, a Pharisee, and a Levite are located on pedestals above the north doors. Judging from the sculptures' anatomical precision, Leonardo either worked on them himself or at least developed detailed sketches for them.

But Leonardo's work on the Baptistery didn't end there. He later got involved in a second round of work that was more monumental than the first: Leonardo developed a scheme for transporting the building! Believe it or not, he actually proposed a plan to lift and move the entire Baptistery of San Giovanni. He had the idea that elevating the structure so that it would sit upon a marble base would make the church more authoritative and divine. Needless to say, this project would have required an enormous engineering effort.

Build It and They Will Come: Designs for Other Public Structures

Most of Leonardo's architectural designs were for cathedrals or entire cities, but he also worked on a variety of smaller-scale public projects. Unfortunately, most of these public designs were never built. Leonardo employed his creative talents to design many public buildings with the goal of improving functionality and enhancing city dwellers' lives. He also included elements based on ideas of symmetry and balance, just like those he used in his designs for religious buildings.

Leonardo designed to extremes, even though some of his projects were more pedestrian in nature. For example, one sketch of a horse stable includes arches and columns supporting a vaulted ceiling, including three lower-level arcades and a number of air-circulating openings outside the building. Along with his design, Leonardo also included notes on how to run a fresh, orderly stable.

In one of his more elite forays, Leonardo designed a palace with a series of multileveled porticos. He designated the light and airy top levels of the palace for the upper classes, leaving the roads and paths that extended through the lower levels for the merchant classes. He reserved the roads through the base of the structure for transporting animals. The height of the palace was equivalent to the width of the streets below it, and he added porticoes and windows to improve airflow through the structure. In spite of its intricacies, Leonardo's design also had more pragmatic intentions; it was an attempt to ameliorate the narrow, crowded conditions on Milan's existing streets, which many designers and scientists of the day believed had actually contributed to the plague that killed almost a third of Milan's population between 1484 and 1486.

During his time in France with King Francis I, it's thought that Leonardo helped design the king's château, Chambord. Construction took place

between 1519 and 1547, and Leonardo probably worked on initial plans for such features as a double spiral staircase. This special stair was similar to the four-ramp staircase that Leonardo had designed for a military fort (see [number 45](#)). Reportedly, the two paths of the spiral staircase allowed the king's wife to take one route and his mistress to take another, which meant there wouldn't be any unpleasant chance encounters.

Leonardo's public projects include work he did in 1492, with Ambrogio da Cortis and Bramante, to rebuild the public marketplace in Vigevano. While today the city of Vigevano boasts that Leonardo designed their public square, in truth it's possible that only his plans for the plaza's overall proportions were fully realized.

In 1518, Leonardo began one of his last architectural projects, studying the topography of the Loire River valley, in France, for a royal fountain he was designing. Like so many of his other projects, however, this fountain was never built.

Military Architecture: The Design of Defense

Military architecture today is a highly specialized field. Can you imagine a painter with no military training just hopping on a flight to Fort Bliss and putting up towers? Leonardo faced no such restrictions. During his time with Francesco Sforza in Milan, he designed buildings with various military reinforcements. His ability to design for the military endeared him to his patron—never a bad thing for an artist! One such building was a castle with a triple defense system. Between about 1487 and 1490, Leonardo sketched both a plan and a perspective drawing for one corner of this building. He made a point of showing two different angular fortifications, one extending over the corner of the fort and the other (which included a formidable moat) extending over part of the external wall.

His design included a series of cannons located on the overhanging wall, which allowed the castle defenders to shoot directly at all attacking forces. Leonardo also designed a triangle-shaped bastion, a structure that allowed the soldiers inside the fortress to defend the entrance. Leonardo's drawing for this type of structure was probably based on existing buildings, and it dates to his time in Romagna as Cesare Borgia's military engineer (between about 1501 and 1504). The design included three small structures, probably service buildings, on top of the main edifice. There was also a series of embrasures (openings for cannons) along the top wall.

But there's more. Leonardo also designed an innovative staircase for use in a fortified tower. His scheme included four different ramps. Each path was independent of the others, allowing soldiers to go up or down the four-story tower without running into groups going in the opposite direction. This technique could improve the soldiers' response times, as they would be able to move both troops and weapons quickly during an attack. Leonardo's design for this structure, probably also done between 1487 and 1490,

included both a perspective view of the tower with the staircases exposed and a top plan view.

In about 1502, Leonardo designed an addition to a moat. And no, his solution didn't involve just filling it with alligators! He did something much more interesting. He hid a cylindrical tower under the water, giving it a gently sloping roof that stuck up slightly above the water's surface. This system allowed defenders inside the moat tower to fire weapons right across the water's surface. Wet hay would cover the roof of the tower to protect against damage from incoming gunshots.

He Built This City

Urban design was of major interest during the Renaissance. Of particular importance was a place for people to gather for political and social events, which gave rise to the formation of the town center. The public space, or *piazza* (plaza), was one of the most common architectural elements during the Renaissance. Add to the mixture defense towers and palaces, which were also common during the fifteenth and sixteenth centuries as key symbols of a family's wealth and influence.

Renaissance design influenced the setup for Milan's city center, as was the case for so many other European cities. Its major structures are the Castello Sforzesco and the Duomo cathedral. Although the architects of that time were working on Renaissance-style designs, they also focused much of their energy on continued construction of projects that had begun in the medieval period, such as the church of San Giovanni in Florence. Just like the artists of the time, Renaissance architects looked to classical Rome for inspiration, and a mandatory part of the architectural apprenticeship usually included a trip to Rome to study the ancient orders.

Somewhere along the way, Leonardo developed a taste for urban design. His notebooks are filled with sketches of buildings, bridges, tunnels, streets, and entire cityscapes. As Milan's population grew, Leonardo sketched out a proposal for separated "satellite" cities that would surround a central core. Sounds like suburbia, doesn't it?

Leonardo based this particular idea on a concern for the health of Milan's citizens. Europe faced a number of plagues throughout history, but Milan was hit particularly hard by a series of plagues between 1484 and 1485. As a result, Leonardo started to think about a "healthy design" for an ideal city that emphasized cleanliness and hygiene. Some of Leonardo's suggestions included wider streets, more space in between buildings, and an anatomically based "circulatory system" of roads that would allow for better

air passage. Applying his humanist, classical training to urban design, Leonardo came up with a system of proportion whereby city streets had to be at least as wide as the houses were tall. While Leonardo's goals of cleaning up Italy were certainly admirable, it's evident today that his schemes were inadequately engineered. Still, his sketches of separate transportation passageways for horse-drawn wagons and foot travelers prefigured developments of modern city planners.

Leonardo also proposed the idea for a multilevel city where workers and craftsmen would literally function beneath the wealthy, the clergy, and others with more noble stature (see [number 44](#)). (How would *you* like to live under your boss's feet?) For these studies, he likely drew on his knowledge of other architects, including Alberti and Brunelleschi, who had produced similar ideas.

In 1515, Leonardo outdid himself when he submitted a plan for a combined city and palace complex in Romorantin, France, to Francis I. This design, contained in the *Codex Arundel* (see [number 72](#)), shows bridges, canals, and a multilevel city center with underground traffic tunnels. Leonardo's design, unfortunately, was never built.

Leonardo was also a pioneer in the field of cartography, particularly in the production of accurate city maps. His map for the town of Imola, produced during his time in Florence around 1502, is thought to be one of the first geometrically precise town plans. This plan may have had strategic importance, as notes included along with the drawing contain distances and directions to various locations in Imola.

PART 3

What It's All About

IN ADDITION TO working on many projects related to painting and architectural design, Leonardo devoted much of his time to studying the sciences. He based his theories on observations of the natural world and then attempted to explain and understand his observations. In this regard, Leonardo was the first of the modern scientists, since his methods were a sharp contrast to the medieval world in which religious mystery cloaked science. While the “Father of Modern Medicine” title usually goes to Hippocrates, Leonardo comes in a close second.

As discussed in Part 1, Leonardo spent his childhood immersed in nature, observing and sketching what he saw. As an adult, he asked questions and sought answers to the mysteries of the world around him. His investigations led him to study anatomy and zoology. He performed detailed dissections on both animals and humans. He was also interested in botany, geology, and the behavior of water as a fluid.

Leonardo's interest in flight led him into engineering, where he invented a number of flying machines. He also spent time as a military engineer, inventing new weapons and defensive mechanisms. His other inventions ranged from improvements in the printing press to a diving apparatus that would allow swimmers to breathe underwater. Many of his inventions were never built and were, in fact, beyond the technological capabilities of his time. However, some of his designs—his

parachute, for instance—have been built in modern times, and they work quite well.

Observe and Understand

Leonardo's scientific pursuits have earned him a firm place as the first of the true modern scientists. In fact, if he hadn't also been such a talented artist, he might be remembered as a scientist who "sketched a little" on the side. Leonardo was uniquely placed historically, bridging the gap between the hocus-pocus of the medieval period and the inquiries of "modern" science. At the end of the Dark Ages in the fifteenth century, the scientific discoveries of classical Rome and Greece had been largely abandoned in favor of biblical teachings, which were taken as literal truth by most of the population.

Leonardo broke with this tradition by actually asking questions, and from his earliest days he made detailed observations of the natural world around him. This work soon led to a desire to understand and predict, rather than just describe. Leonardo's tenacity and his varied interests allowed him to make important observations and discoveries in a wide range of scientific fields, from anatomy to zoology. His studies of the motion and the behavior of fluids (such as water) were impressive. He investigated plants, animals, and geology. In addition, Leonardo made notes on astronomical topics, such as the nature of the moon, sun, and stars, and fossil formation.

Although Leonardo's observation-based method seems simple to us today, his technique was revolutionary in his day. He would ask a seemingly simple question, such as "How do birds fly?" and then spend weeks or months making painstaking observations. These observations would include watching birds in flight, sketching birds in various poses, observing live birds close-up, and dissecting birds to understand their musculature and anatomy. He then translated his notes into a more general theoretical understanding of aerodynamics and flight. Leonardo, being the hands-on guy that he was, then designed flying machines that would give humans the same experience as birds.

Leonardo also pioneered the technique of scientific illustration. While we take for granted the technical drawings that appear in our textbooks, we really should thank Leonardo for coming up with this idea. He filled many of his notebooks with meticulous sketches, accompanied by detailed notes, of various anatomical or mechanical principles. Unlike his predecessors, who relied on long-winded explanations, Leonardo felt that his sketches and drawings were the primary tool in illustrating his various points; his written notes were actually secondary. Sometimes a picture really is worth a thousand words!

Love That Body!

Leonardo da Vinci was a man who could appreciate a great body. And all in the interest of science, really! During his lifetime, the field of medicine was becoming more important, and artists were increasingly fascinated with drawing the human body accurately. In Leonardo's case, he went a step further to figure out how the bodily systems beneath the surface worked.

Leonardo's early paintings were studies in a new humanistic style of art, and he was way ahead of his contemporaries in this regard. The best example is his *Vitruvian Man* drawing of 1490, one of the first accurate expressions of the relationship between the human form and geometrical proportions. Leonardo's interest in anatomy ran deep, both literally and figuratively. He spent years researching the intricacies of how our bodies function. In 1489, he started work on a notebook focused specifically on anatomy. He studied all parts of the body, especially the brain and eyes. He sketched skulls in cross section, showing both an amazing understanding of the visible and an interpretive ability to figure out the unknown. His drawings demonstrate a clear relationship between eyes, nose, teeth, jaw, and vertebrae. To make things clearer, he detailed most sketches with notes and measurements—almost like an architect doing construction documents. Many of Leonardo's other sketches define human anatomy with an unprecedented degree of detail. His drawings of the human rib cage, spine, and coccyx are highly accurate. He also rendered sketches of nudes in various positions, indicating a significant understanding of how the human form worked in motion.

Also, as the doctors of the day were only starting to realize, the best way to truly learn about the inner workings of the human body was, simply, to take a look inside. In order to study musculature and bone structures in the arms, legs, and other body parts, Leonardo dissected corpses in the early 1500s, possibly including a homeless woman who had been about nine months pregnant at the time of her death. One of his sketches shows a human fetus,

complete inside a woman's body with placenta and uterus. Leonardo's drawings describe a curled fetus and umbilical cord as they lay inside the womb. However, in his drawings the unborn baby is a highly muscular infant. From this error, we can see that his factual knowledge was probably minimal. Despite some mistakes, Leonardo was one of the first to draw the female reproductive system accurately, and his drawings are certainly the most detailed to come from the Renaissance period. He also drew detailed sketches of other systems and organs, including the human heart.

Leonardo's work, detailing the nature of organs that had been previously undefined, was quite daring for the time. Renaissance clergy and others were of the mindset that the heart was some sort of spiritual element, not just a muscle like any other in the body. Although Leonardo explored science in rational, realistic terms, he did not dismiss spiritual notions. He always acknowledged the divine in his scientific studies, marveling at the complex beauty God had created.

From the Inside Out: Studies of Human Systems

Leonardo never stopped trying to learn more about the human body. You might even call him art's first forensic scientist. Not content just to draw the body as he saw it from the outside, he strove to understand the human form from the inside. How far would he go to increase this understanding? Farther than was acceptable or even legal at that time. He cut up cadavers, studied organs and skeletal substructures—all in an effort to draw and paint more accurately. Circulation and musculature systems intrigued him for the same reason. But what mattered most to Leonardo was the quality of his work, and he was willing to get his hands dirty—literally—to ensure that quality.

It wasn't just the body itself that interested Leonardo; he plunged deeper inside to study blood circulation and the heart, first in the 1490s and again about twenty years later when he produced many drawings that detailed human circulation. Leonardo never figured out the exact connection between blood flow and the heart muscle, though. He used his studies of animals (and later, humans) to map out the basics: the heart was a four-chambered muscle somehow connected to the pulse you could feel in your wrist. Leonardo also figured out that arteries could become overfilled and that this situation could lead to sickness or even death. And so he actually predicted the concept of clogged arteries—an ailment that would become a major medical focus in later centuries.

Leonardo also paid particular attention to musculature, as we can see in several of his sketches. Some of his earlier anatomical drawings show extremely muscular men (perhaps indicating his own preferences), while later sketches focus more on anatomical detail. A series of shoulder drawings from 1511 show tremendous schematic detail on the layering of bodies, depicting skin, bone, muscle, and surrounding tissue as a complex

web. Leonardo's paintings from twenty years earlier show this same fascination with the muscle groups, which create sculpted definition.

And now on to the fun stuff—sex! Leonardo was very interested in human reproduction. He initially thought the male reproductive organs had a direct channel that went straight to the heart and lungs and, therefore, the brain. (Hippocrates, a Greek physician from the fifth century B.C. and one of the founders of modern medicine, originally suggested these views.) As mentioned earlier in reference to the heart (see [number 48](#)), the popular view during the Renaissance was that bodily organs represented divine, spiritual entities. In keeping with this tradition, Leonardo considered the main outputs of the male sex organs as, essentially, sperm and “spirit.” He also believed the human heart was a spirit. Nice idea, but he quickly realized that this approach was wrong because it could not be proven. The idea of a “spiritual channel” could simply not be borne out by the cold, hard evidence that Leonardo personally witnessed. At least Leonardo was willing to admit when he made a mistake—wouldn't it be nice if everyone did?

Fawning over Flora

Leonardo began his long history of drawing animals by studying them in nature. Many of his paintings show different animals, some moving and some standing still. The *Adoration of the Magi*, for example, includes horses, a camel, and a mysterious third creature that Leonardo never finished. He also sketched an iconographically significant lamb in *The Virgin and Child with Saint Anne* (see [number 39](#)), though he himself may not have painted that particular portion of the work.

The horse was one of Leonardo's favorite animals. We know about his obsession with them because they're the animal he sketched the most. He drew them standing, sleeping, and in various states of motion. His *Statue of Francesco Sforza* (see [number 29](#)), if completed, would have been the largest monument of a horse anywhere in Europe. Toward the end of his life, Leonardo also made many bronze horse models that he gave to his final patron, King Francis I.

Leonardo's notebooks also prominently feature cats. He wrote stories about cats and sketched them in precise detail. He drew felines in a variety of positions, both asleep and in motion. Leonardo also painted other animals at different points throughout his career, including pigs, bears, goats, birds, and dragons. There are also drawings of several animals that look like either crossbreeds or completely fictional beasts.

What is unique about Leonardo's drawings of animals is that he applied the same principles of geometry and proportion to them as he did to his architectural drawings. He made notes, for example, about how a horse's ear should be one-fourth as long as its face. He also studied the movement of birds in flocks and tried to rationalize their tendency to fly in circles. When he wanted to paint animals as accurately as possible, Leonardo knew that he would have to learn more about how their bodies functioned. His notebooks tell us that he made several visits to slaughterhouses. His sketches contain

studies of dissected animals, including some highly detailed drawings of pig hearts. Once he revealed the animal's innards, Leonardo was able to see the still-beating heart and observe how blood was moving out of the heart and through the arteries. These scientific sketches were extremely significant because they were the first of their kind. Not only artists, but also future doctors would study Leonardo's drawings and methods as they later began their own research into anatomy.

Leonardo's interest in the natural world spread to flora as well as fauna. Unfortunately, Leonardo's plant sketches are some of the worst preserved of any of his drawings. We do know he drew lots of plants because his first biographer, Giorgio Vasari (1511–1574), tells us so. One existing sketch is the *Star of Bethlehem*, which was created between 1505 and 1507. This sketch is significant because, in addition to being one of his few surviving plant drawings, it shows a highly stylized, abstract flower. In contrast, most of his earlier plant drawings were more scientifically accurate. While a single flower may not seem like such a big deal, it's important to understand that Leonardo didn't just paint what he saw—he was also very creative.

Other surviving drawings include mountainous landscapes and rivers. Leonardo made these artworks in media such as metalpoint, chalk, and pen and ink. He is also known for the detailed botanical renderings of various plants and trees that exist in some of his paintings. While many Renaissance artists focused exclusively on the painting's central figure, Leonardo paid attention to every detail, and his work is richer because of it.

The Perfect Man

One of the most famous drawings of all time is Leonardo da Vinci's *Vitruvian Man*. In the original sketch, which currently resides in Venice, Leonardo used both ink and watercolor. Leonardo's image has become an icon for art, science, and the Renaissance. Today it's such a widely recognized symbol that you can see it everywhere—in high-school textbooks and museum galleries, even on T-shirts. What is it about this particular drawing that has generated such attention? What is this drawing even about?

The source of inspiration for the *Vitruvian Man* was, not surprisingly, Vitruvius. But who was he? He was actually a Roman engineer from the first century B.C. who codified some of the first basic principles of architecture. Serving as chief architect under Julius Caesar, Vitruvius was ancient Rome's resident expert in urban planning and structural design, and he wrote the first definitive treatise on architecture, *The Ten Books on Architecture* (around 27 B.C.), in which he specified guidelines for city planning, building materials, hydraulics, and other civic projects. This influential book also established differences for religious, private, and public designs—the first time that such distinctions had been laid out so clearly. In addition to providing rules and principles for architects to follow, Vitruvius expressed the important relationship between architecture and social-cultural values.

It is likely that Leonardo's first exposure to Vitruvius, and his ideas on form and proportion, came during his apprenticeship to Verrochio. He was also probably influenced by Alberti's interpretations of the same subject. But Leonardo, as usual, came up with his own radical uses and interpretations.

In fact, Leonardo's *Vitruvian Man* could have been a poster child for Renaissance ideals of humanism and proportion. The drawing consists of a square that is partially inscribed in a circle, with a human male form inscribed into the combination of these two basic geometric shapes. This drawing has become so celebrated because it's the first example of a human

form that wasn't forced into an unnatural distortion simply to accommodate the geometry.

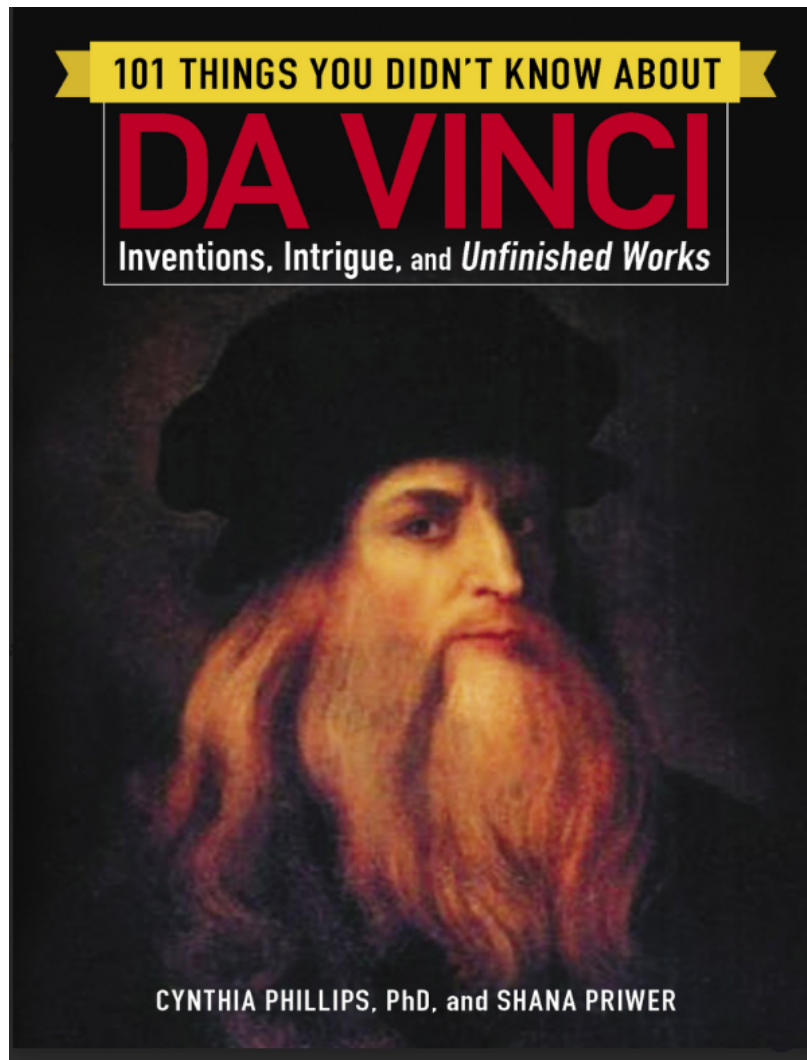
Architecture, for Leonardo and most Renaissance architects, was a matter of harmonious modularity. As Leonardo proved with this drawing, it was possible to view the human body the same way: a composition of anatomical building blocks comparable to those of the built world. Interestingly, it's been said that in a not-so-rare moment of artistic hubris, Leonardo may have borrowed his own self-portrait to use for the head of Vitruvius in this influential work! Doesn't it seem appropriate, though, that Leonardo himself might be both model and artist for this symbol of the Renaissance?

Getting Physical with Science

Leonardo did more than draw circles and squares! Sure, he studied anatomy, but his interest in science didn't end there. He was also a student of the physical and natural sciences. In particular, he used his methods of observation and inquiry to look at a number of problems in physics, geology, astronomy, and other fields.

In geology, Leonardo's contribution is particularly striking. While working as part of Duke Sforza's court, Leonardo devoted time to surveying various mountains and valleys, and this work served as background for military engineering projects, such as making roads and tunnels. During this period, Leonardo most likely had ample time to study the area's various rocks, and he also observed the fossils (mostly mollusk shells) present within the rocks. From his writings, we know that Leonardo understood the process of sedimentary rock formation, which occurs through sequential deposition of small layers in a watery environment. He also understood erosion, the idea that wind, rain, and rivers progressively wear away rocks. In fact, he realized that, as a result of erosion, sand and rock particles are eventually carried to the ocean to repeat the cycle.

How is it that shells could be found in rocks that currently lay atop mountains? Scientists pondered this central geological question in Leonardo's day, and Leonardo rejected the two main suggestions prevalent at that time, which held that the shells had either been carried there by the great flood mentioned in the Bible, or that they had formed there in the rocks. From his observations of nature, Leonardo knew that shells had to come from living creatures and that these living creatures would have had to move around to eat and grow—they couldn't have formed inside a rock. He also noted that the world probably wasn't ever covered by a single great flood, since the water wouldn't have had anywhere to drain. Even if a flood had taken place locally in biblical times, any shells carried up to the



[Click Here To Download The Full Copy](#)